

**NEW!**  
Pull-Out Program Listings

# HOT CoCo

THE MAGAZINE FOR TRS-80 COLOR COMPUTER® USERS

A CWC/I PUBLICATION  
MAY 1985  
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## ***Digitize Me!***

Your CoCo Talks, But  
The Voice Is Yours

Create Custom  
Soundtracks  
For All Your Programs

Tune In to The Source

Contest!  
Solve the Puzzle,  
Win a Prize





# Radio Shack Has Want for Your

## Save Time and Effort at Home

### Color File.\*\* An easy-to-use

home filing system to alphabetize, select, examine, revise and store household records. Comes pre-set with seven files—or create your own. #26-3103



**2495**

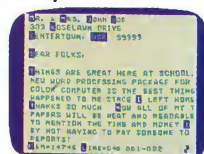
**Spectaculator®.** Do home planning and budgeting with this electronic spreadsheet. Just enter numbers and formulas—results are displayed on command. Ideal for home financial forecasting. #26-3104



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### Color SCRIPSIT®. A powerful

home word processing system for correction-free letters. Text can be saved on optional cassette recorder or printed with optional printer. #26-3105



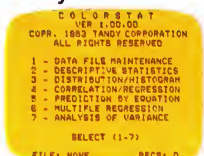
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**Personal Finance II.** Includes 26 expense categories, including auto, gas, food and more. Review spending on year-to-date or category basis. #26-3106



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**COLORSTAT.\*\*** Use your Color Computer to turn complicated home or business data into statistics for easy analysis, or print them on an optional printer for your records. #26-3107



**2495**

\*Joysticks required.  
\*\*Cassette recorder required.  
\*\*\*Joysticks and recorder required.

## Educational Software from Walt Disney

### Your Choice

**3495**  
Each

### Telling Time with Donald.\*\*

Teaching your children to tell time is easy with a little help from Donald Duck. For ages 5-8. #26-2530



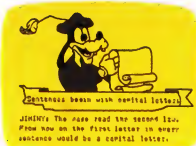
### Mickey's Alpine Adventure.\*\*

A frosty exploration of spelling and reading concepts. Learn important spelling rules and the sounds of vowels and consonants with Mickey Mouse and Donald Duck. #26-2534



### Mickey's World of Writing.\*\*

An exciting way to build important writing skills! Youngsters learn the basics of sentence structure and fundamental writing skills with Mickey Mouse. For ages 8-11. #26-2532



**Space Probe: Math.\*\*** An exciting interstellar study of mathematical word problems. Youngsters learn the concepts of area and perimeter during outer space adventure. For ages 7-14. #26-2537

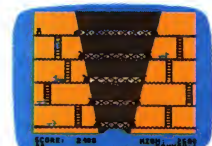


**Downland.\*** You're alone in a secret cave, traveling from chamber to chamber collecting keys, gold and diamonds. But can you jump, climb and run to safety? #26-3046



**2495**

**Canyon Climber.\*** Your climbing skills are under test when you find kicking goats, falling rocks, zinging arrows and more on your way to the summit. #26-3089



**3495**





# the Software You Color Computer

## Learning Programs from Spinnaker

Your Choice  
**2995**  
Each

**Facemaker.** An exciting game to help your kids learn computer basics while they create an animated face. #26-3166



**Kids on Keys.** Your kids will enjoy learning with the computer as they identify numbers, letters and words. It's fun and your kids will learn important math and spelling skills. #26-3167



**Kindercomp.** Introduce your children to computer graphics! Even the youngest in your family will enjoy creating vivid color pictures and exciting sound effects by pressing a few keys. #26-3168



**Fraction Fever.** An exciting math contest! Your kids will develop a real understanding of fractional relationships as they guide their graphic "pogo stick" through this colorful game. #26-3169



### Dungeons of Daggorath.

You're pitted against a succession of awe-some beasts in the fearful dungeon. Each victory brings you closer to your ultimate foe—the wizard. #26-3093



**2995**

**Baseball.\*** This exciting game plays just like the big leagues! You are the coach—it's up to you to control the pitching, defense, and running for extra excitement. #26-3095



**2495**

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### Vocabulary Tutor 1.\*\*

Give your children a head start in school. Start building their vocabulary at home with an exciting word and description matching game they'll love to play. For grades 3-5. #26-2568



**895**

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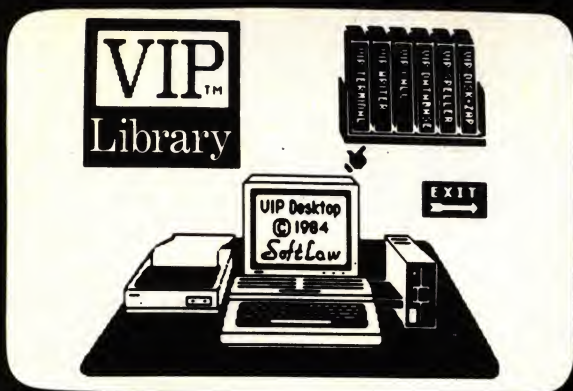
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# VIP Integrated Library™

## VIP Desktop Magic!

Finally, you can have the power and integration of Lotus Symphony™, 1 2 3™ or Open Access™ for the larger micros on your Color Computer! The convenience of instant changes to a new application and effortless transfer of files is at the tip of your finger.

With VIP Desktop, the six applications of VIP Library are integrated into one program, on one disk. You have instant access to word processing, with a spelling checker always in attendance, data management with mail merge, spreadsheet financial analysis, telecommunications and disk maintenance. Just move the hand to point to the volume, and the new application is there. And VIP Integrated Library has been made to work well with one disk drive, or all four, so be ready to push your Color Computer to the limits!

## Elegance!

VIP Integrated Library is a product with finesse, inside and out. Inside is one awesome but very elegant program. On the outside, it comes handsomely bound in two cloth covered, gold embossed binders with slipcases - like those you get with software for the Tandy 2000™. And remember, to get software of this quality for the Tandy 2000 you would have to pay hundreds more!

## Stand-Alone Power

VIP Integrated Library is not one of those slip-shod, all-in-one slicer-dicer machines, good for one day and then you throw it away. It fully integrates the six top-of-the-line stand-alone programs described in the following pages: VIP Writer, VIP Speller, VIP Calc, VIP Database, VIP Terminal & VIP Disk-Zap. You can buy the entire Integrated Library at once, or you can buy one or two programs that you need now and upgrade to the integrated Library later.

## Shared Files, Shared Features

All VIP Integrated Library applications share common features, such as ease of use, built-in help, the same commands, full printer control, full use of your 64K of memory, and step-by-step tutorials. Most important, all essential applications feature professional high resolution lowercase displays to give you a choice of 51, 64, or 85 characters per line, with 21 or 24 lines per screen. You get a professional display on your Color Computer without any hardware modification!

**Buy the Integrated Library for**

**\$149.95**

**Radio Shack Catalog No. 90-0213**

Or buy the individual volumes separately,  
as shown on the following pages!

**Requires 64K and one or more disk drives.**

VIP Integrated Library comes on one disk. Tape versions of programs are not supplied.

†Those already owning one VIP product, except for VIP Speller, may purchase the Integrated Library by sending in the VIP program with a check or money order for \$99.95. This upgrade offer is limited to one Library per person; credit will ONLY be given for one VIP program, regardless of how many are owned. This upgrade offer is available ONLY through SoftLaw, and not through Radio Shack stores or dealers. Be sure to include \$6.00 for shipping & handling.

# VIP Writer™

**RATED TOPS IN RAINBOW**

**COLOR COMPUTER MAGAZINE & COMPUTER USER**

The most powerful and easy-to-use word processor is available in the showpiece and workhorse of the Library: The VIP Writer™.

The result of two years of research, the VIP Writer™ offer every feature you could desire from a word processor. It is the most powerful, fastest, most dependable and most versatile. With the hi-res display, workspace and compatibility features built into the Library the Writer is also the most usable.

"... Nearly every feature and option possible to implement on the Color Computer. The design of the program is excellent; the programming is flawless. October 1983 "Rainbow"

"Among word processors for the CoCo, VIP Writer stands alone as the most versatile most professional program available." May 1984 "Computer User"

The Writer will work with you and your printer to do things you always wanted to do. Every feature of your printer can be put to use, every character set, every graphics capability at any baud rate, EVEN PROPORTIONAL SPACING. All this with simplicity and elegance.

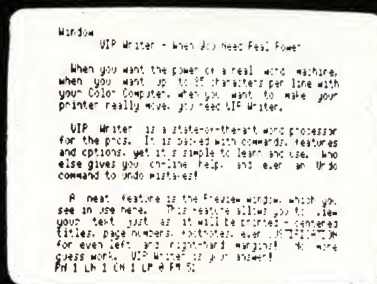
## Professional features of particular note:

- Memory-Sense with **BANK SWITCHING** to fully utilize 64K, giving not just 24 or 30K, but up to 53K of workspace with the tape version and 50K with the disk version.
- **TRUE FORMAT WINDOW** allowing you to preview the printed page ON THE SCREEN BEFORE PRINTING, showing centered lines, headers, FOOTNOTES, page breaks, page numbers, & margins in line lengths of up to 240 characters. It makes HYPHENATION a snap.
- A **TRUE EDITING WINDOW** in all 9 display modes for those extra wide reports and graphs (up to 240 columns!).
- **FREEDOM** to imbed any number of **PRINTER CONTROL CODES** anywhere, **EVEN JUSTIFIED TEXT**.
- Full 4-way cursor control, sophisticated edit commands, the ability to edit any BASIC program or ASCII textfile, **SEVEN DELETE FUNCTIONS**, **LINE INSERT, LOCATE AND CHANGE**, wild card locate, up to **TEN SIMULTANEOUS** block manipulations, word wrap around, programmable tabs, display memory used and left, non-breakable space, and headers, footers and FOOTNOTES.
- Automatic justification, automatic pagination, automatic centering, automatic flush right, underlining, superscripts, subscripts, pause print, single-sheet pause, and print comments.
- Type-ahead, typematic key repeat and key beep for the pros, **ERROR DETECTION** and **UNDO MISTAKE** features, **3 PROGRAMMABLE** functions, auto column creation, and instant on-screen **HELP**.

**Radio Shack Catalog No. 90-0141**

**32K (Comes with tape & disk) \$69.95**

**VIP Writer-VIP Speller Combo comes in VIP Writer Binder.**



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**Radio Shack Catalog No. 90-0142**

**32K DISK ONLY \$49.95**

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**VIP Programs do not work with JDOS**



# VIP Database™

"ONE OF THE BEST" JULY 1984 "RAINBOW"

This high speed MACHINE LANGUAGE program fills all your information management needs, be they for your business or home. And it does so better than any other database program for the Color Computer, featuring machine code, lowercase screens and mail-merge capabilities. Inventory, accounts, mailing lists, family histories, you name it, **VIP Database™** will keep track of all your data, and it will merge **VIP Writer™** files.

The **VIP Database™** features selectable lowercase displays for maximum utility. It will handle as many records as fit on your disks. It is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses, etc., in ascending or descending alphabetic or numerical order. Records can be searched for specific entries, using multiple search criteria. With database form merge you may also combine files, sort and print mailing lists, print "boiler plate" documents, address envelopes - the list is endless. The math package even performs arithmetic operations and updates other fields. Unlimited print format and report generation with the ability to imbed control codes for use with all printers.

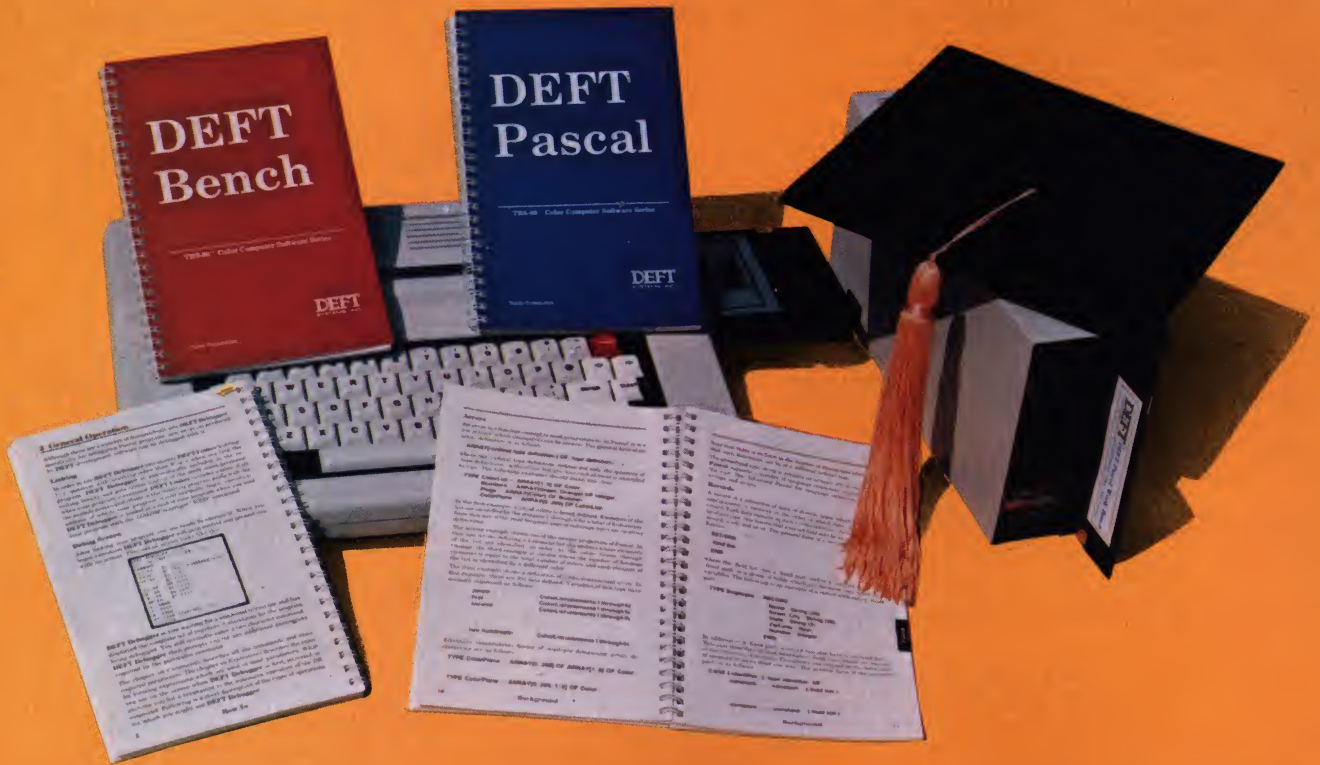
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32K DISK \$59.95

64K Required for math package & mail merge

		VIP List		01	
M1				M1	
A		B		C	
Check Register					
C#	Date	Description	Check	Deposit	
			Debit	Credit	
0001	01-01	Jan 1st	100.00		
0002	01-05	Payroll	50.00		
0003	01-10	Deposits		200.00	\$201.21
0004	01-15	Check # 1	25.00		
0005	01-20	Check # 2	25.00		
0006	01-25	Deposit		50.00	
0007	01-30	Check # 3	25.00		
0008	01-31	Check # 4	25.00		
Total			Total	Final	
Credit			Deposit	Balance	
200.00			200.00	201.21	



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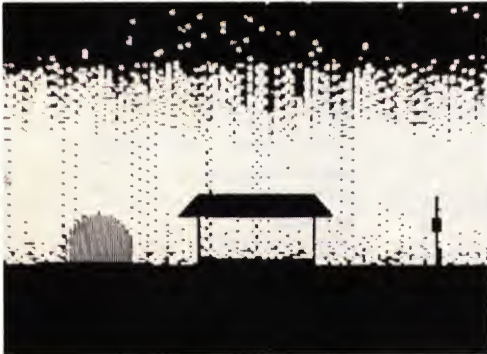
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## How Do We Look?

**W**e look a little different this month. This issue is the first of our "new and improved" *HOT CoCo*. We've completely redesigned the magazine's interior, added a feature or two, and taken more steps to make *HOT CoCo* the most read and most referred-to source on the Color Computer.

Our redesign serves two purposes: It makes the magazine more aesthetically pleasing, and, through a change of typography, we are able to publish more material than before. Our monthly features are easier to spot, too, because of their distinctive headings.

One important aspect of our new look, and one on which I would like to hear your comments, is our new pull-out section containing each issue's program listings. This section allows us to be more creative with the rest of the magazine, and we think it will be a convenience to those who type in our listings. If you like, you could punch holes for a three-ring binder in each month's section for easy referencing later.

Several new columns and features appear this month, too, and more will follow. Our publisher, Jeff DeTray, has claimed the back page of *HOT CoCo* as his own. He will share his observations of and enthusiasm for the Color Computer. His column is called *The Corner Office*; please read it.

James and Victor Perotti start class this month with *Assembly 101*. If our reader surveys are any indication, most of you are anxious to learn a little Assembly-language programming. We think that this father and son team has a winner in this series; read it and see if you agree.

Never let it be said that *HOT CoCo* isn't a democratic magazine. On page 88, across from our Reader Service card, is a list of the articles and features in this issue. The first question on the Reader Service card asks you to pick your favorite from this list.

Do yourself a favor and vote each month. We will use the results to help determine *HOT CoCo*'s editorial focus. And while you're at it, take the time to fill out the rest of the card, including circling the numbers of advertisers whose products interest you. The more *HOT CoCo* and our advertisers know about your needs, the better we can fill them.

Reviews are a little different, too. Each one has its own title, and we've reduced the rating scale from one to ten to one to six in order to improve rating consistency. We've also moved reviews, *Doctor ASCII*, and *Mindbusters* to the front of the magazine.

We aren't done yet. We'll be fine-tuning the magazine in the next few months. In fact, we already want to change a couple of things, such as the System Requirements boxes (too ugly, could be more explicit) on each article.

Magazine redesigns have a way of generating reader comments, good and bad. I hope this is true in our case. Please, write to me; let me know your gut reaction. This is your magazine, and I want to know how well I'm running it.

By the way, if you really like what you see, the credit goes to our art director, Donna Wohlfarth.—*Michael E. Nadeau* ■

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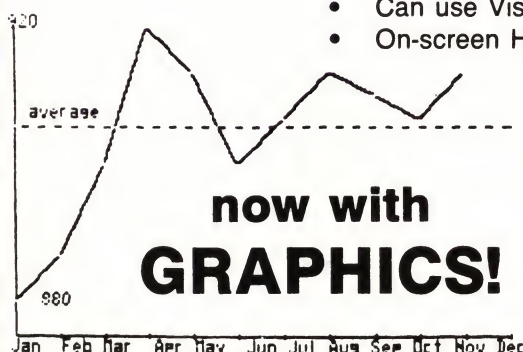
*"Eat your heart out, Lotus 1-2-3!"*

*Scott Norman, HOT CoCo, October, 1984.*

#### Built-in Features:

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- Super-fast Smart Screen Refresh
- Auto-Repeat Keyboard Driver
- Keysaver (TM) repeats last command x times
- Disk Operating System (works just like ROM DOS)
- Easy communication with BASIC/DOS programs
- Two-way communications with PRO-COLOR-FILE ★ Enhanced ★
- Outputs to ASCII Word Processors like Telewriter-64
- Fast 16-Digit Arithmetic with Scientific Functions
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Instant CoCo is a cassette tape containing the major programs from this issue of *HOT CoCo*. Its purpose is to save you the time and effort of typing long program listings into your Color Computer. You simply load the programs from the Instant CoCo tape using your cassette recorder. The instructions for operating each program are found in the corresponding *HOT CoCo* article. Both Basic and Assembly-language programs are included on the tape.

The Instant CoCo symbol appears in *HOT CoCo*'s table of contents and on the program listing for each article with a listing used on the Instant CoCo tape. As an added extra, each tape also contains a never-before-published Bonus Program, complete with instructions.

The directory below lists all programs included on this month's Instant CoCo cassette. Shown first are the name of the article with a descriptive blurb and its author, followed by the page number in this issue where the article appears. Next comes the file name of the program on cassette. Finally, there is a brief description of the Color Computer system needed to run the program.

This month's Instant CoCo cassette is available for just \$11.47, including postage and handling, from **Instant CoCo, 80 Pine St., Peterborough, NH 03458**. See our ad on p. 64 for more details.

## Instant CoCo Directory May 1985

### Side A

Article Name/Author/Description	Page #	File Name	System
Copyright Statement	---	TITLE	16K CB
Mindbusters/Ramella	20	CONNECT	16K CB
Puzzles of Sam Loyd.		CONTEST	16K CB
Digitize Me!/Rubidge	34	DIGBUILD	64K ECB
Digitize sound with the CoCo's hardware.		DIGITIZE	64K ECB
Using Basic Variables/Gaebler	38	VARLIST	32K ECB
Track Basic variables and their values.		NUMDUMP	32K ECB
		STRDUMP	32K ECB

### Side B

Dawn at the Crossing Gate/Gault	42	DAWN	32K ECB
Create animated graphics with sound tracks.			
Match and Learn/Raymond	54	MATCH	16K CB
Match related word pairs.			
Closed for Inventory/Eisman	56	STOCK	32K DECB
Keep tabs on a small business's inventory.			
Five Card CoCo/Mefford	59	BLKJACK	32K ECB
Your CoCo makes a good blackjack opponent.			

### \*\*\* BONUS PROGRAM \*\*\*

Starship Control/Barbe	---	STARSHIP	32K ECB
Use strategy to drive the enemy out of your quadrant.			

CB = Color Basic, DECB = Disk Extended Color Basic, ECB = Extended Color Basic

## Back Issues

Yes, back issues of *HOT CoCo* are available for all months. This list shows the features in each issue:

**June 1983**—The CoCo word processor; a serial-to-parallel interface project; and the adventure, Cavehunt.

**July 1983**—How to upgrade your CoCo to 64K; cure video RFI.

**August 1983**—Speech synthesis via software; get more colors; build a color monitor driver.

**September 1983**—Disk utilities; hi-res character generator.

**October 1983**—Animation techniques; ROM disassembly, part I.

**November 1983**—Nuclear submarine simulation; ROM-pack primer; banner printer.

**December 1983**—World capitals quiz program; talking spelling tutor; vocabulary-building program.

**January 1984**—Programs for the businessman and investor; ins and outs of database management.

**February 1984**—CoCo-aided circuit design; simulate Extended Basic in Color Basic; change your CoCo's vocabulary.

**March 1984**—How a disk stores information; create your own wordsearch puzzles; dental/medical bill balancer.

**April 1984**—Peripherals buyer's guide; how to shop for a disk drive; disk-fix utility; Lisp interpreter.

**May 1984**—OS-9 review; financial transactions tracker; homebrew spelling checker; CoCo Reversi game.

**June 1984**—Horse-racing and stock-market simulators.

**July 1984**—Do-it-yourself lowercase mod; variable cross-referencer; the game, Python.

**August 1984**—Basic-09 review; database manager program; graphics tutorials; hurricane tracker.

**September 1984**—Educational software buyer's guide; typing-teacher program; the CoCo as a marketing aid.

**October 1984**—A collection of sounds for your CoCo; how to make programs auto-execute; printer spooler.

**November 1984**—Personal money manager program; disk-file protection utility.

**December 1984**—Disk-drive timer; disk drive maintenance tips; full-featured text-editing program.

**January 1985**—Spreadsheet program; stock-charting program; make fancy graphics with your printer.

**February 1985**—Drawing program; user's group list; Space Hawks game.

**March 1985**—Universal screen-dump program; POKE list; utilities.

**April 1985**—Telewriter-64 mods; modem comparison; satellite-tracking program.

You'll also find in each issue our regular features, reviews of popular software and hardware, and dozens of useful programs that are yours for the typing in.

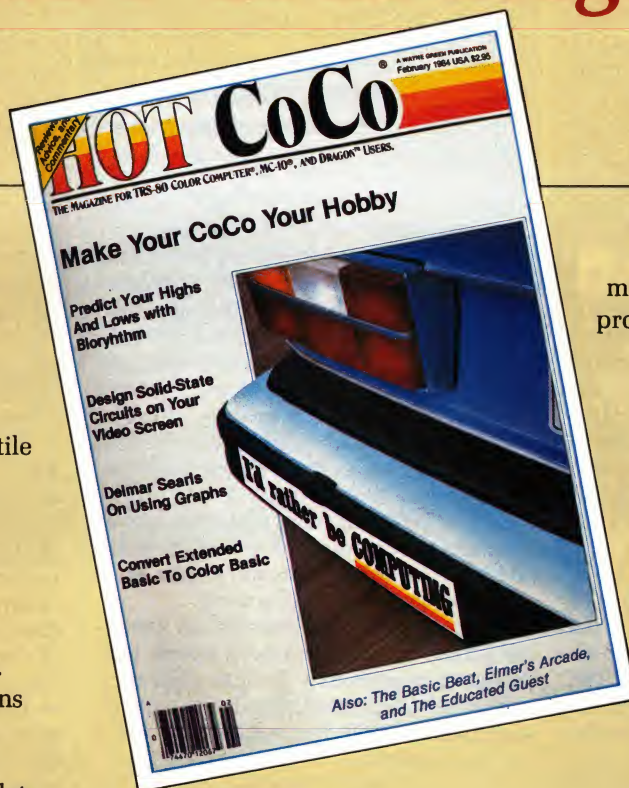
Each back issue costs \$3.50 plus \$1 shipping and handling. On orders of 10 or more back issues, there is a flat \$10 shipping fee. Send your orders to *HOT CoCo*, Attn. Back Issue Orders, 80 Pine St., Peterborough, NH 03458. ■



# Now you can learn how to use your Color Computer for more than just games... with HOT CoCo magazine.

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- **Programming tips & tutorials**—**HOT CoCo** will show you how to program. It's loaded with programming techniques and hints to help the novice and



expert programmer write and improve their programs.

- **New product reviews & announcements**—if you're looking for equipment to expand the use of your computer, **HOT CoCo**

reviews numerous hardware and software products each month. Plus, **HOT CoCo's** new product announcements let you comparison shop at home—spend more time at your computer and less time in computer stores. And **HOT CoCo** is loaded with challenging games to provide hours of fun and excitement for your whole family.

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**355B4**





Each month *HOT CoCo* provides program listings for you to type into your Color Computer and use. If you are new to computing, read this page for advice that will help you avoid problems often encountered when entering programs manually.

## Know the Basics

Before you begin, you should be familiar with the basic operation of your Color Computer. Read the manual and make sure you understand how to enter a program line, save a program to cassette or disk, and make corrections to a program line. The Color Computer manuals are well written, and you will enjoy your CoCo much more if you've read them.

## Check the Requirements

The first thing you should do is make sure that the program you want to enter will run on your version of the Color Computer. You need to know the memory requirements, the type of Basic used (Color, Micro Color, Extended Color, or Disk Extended Color Basic), what peripherals might be needed, and in some cases whether a particular ROM version is needed. (See below for an explanation of the different ROMs.)

All this information is provided in the System Requirements box included with each article that has a program listing. This box gives the minimum requirements to use the program. If, for instance, the box reads "16K RAM, Color Basic," the program should also work on 32K or higher, Extended or Disk Extended Color Basic CoCos.

Once you've established that the program will work on your CoCo, read the article thoroughly. Sometimes it will include information vital to typing in the listing.

## What You See is What You Get

We print all Basic program listings 32 characters across—just as they appear on your video screen. Type in the listings exactly as it appears in the magazine, being particularly careful with spaces and punctuation. If you do this, the 32-character format will aid in proofreading what you have typed in by letting you match beginning and ending characters on corresponding lines. If you have a line that ends on a character other than what appears in the magazine, go back and check for a typo.

## Common Errors

Some characters are easier to confuse than others when you are typing in program listings. And since your Color Computer interprets everything literally, the smallest error can crash a program. Below is a list of characters commonly confused with one another:

zero and the letter O  
colon and semicolon

lowercase l and the numeral one  
uppercase B and the numeral eight

## Weird Characters

The up arrow indicates exponentiation on the Color Computer. Unfortunately, most printers do not have an up arrow. Our printer prints a caret (^) instead. Be sure to type an up arrow in place of all carets in Basic program listings.

## Assembly-Language Listings

*HOT CoCo* often publishes programs written in Assembly language rather than Basic. Assembly listings "talk" to your computer on a much more direct level; Basic requires some translation before your CoCo can execute it. Therefore, Assembly works much faster than Basic. Unfortunately, it is more difficult to learn Assembly-language programming than Basic programming.

But you do not need to know how to program in Assembly to use these programs. You do need, however, something called an editor/assembler. An editor/assembler allows you to manually enter an Assembly listing, and then it "assembles" it into a form that your CoCo can execute. Since editor/assemblers can cost as much as \$80, you probably don't need one unless you want to learn Assembly-language programming.

It is possible to hand assemble an Assembly listing, but this is a tedious process that is best left to someone with a little experience with Assembly programming. It also requires a short Basic routine that prepares your CoCo for hand assembly.

We convert some Assembly programs to Basic DATA statements and include a short Basic routine to load and execute the DATA statements. This gives you a program that you can type in just like a Basic listing, yet it operates much like one written in Assembly.

If you want to run one of *HOT CoCo's* Assembly listings, but it hasn't been converted to DATA statements and you do not own an editor/assembler, check to see if the program is included on our Instant CoCo cassette. All Assembly programs on Instant CoCo are in assembled form, meaning you can load and execute them immediately.

## Speaking of DATA Statements

Since DATA statements often consist of numbers only, it is easy to make a mistake typing them in. One wrong number can crash the program or lock up your machine. When this happens, the only way to recover is often to turn off the computer for a few seconds and then turn it back on. Of course, this wipes out your program in memory.

To avoid this, always save what you have typed in before running it. That way, if you did make a mistake, you can load the program from tape or disk to look for the error,

rather than retyping the entire listing.

One last thing about DATA statements: Error messages that occur due to a mistyped DATA statement line will refer to the corresponding READ statement line earlier in the program. Yet it is the DATA statement that is incorrect.

## If All Else Fails

If you cannot get your typed-in listing to run after checking and double-checking for typos, you can ask us for help. Send a detailed description of your problem along with any error messages given. Ideally we'd like a printout of what you typed. Send a self-addressed, stamped envelope for the fastest reply. Sorry, but we cannot help you if you have modified the original program in any way. Write to *HOT CoCo*, attn. Technical Editor, 80 Pine St., Peterborough, NH 03458.

## Different ROMs

Radio Shack has updated the Basic ROMs in the Color Computer several times since it was introduced. Below is a list of the ROMs and the problems and benefits you might encounter with each one:

- Color Basic 1.0—Cannot fully use the 64K upgrade and has only a 7-bit serial printer routine, which inhibits sending graphics data to a printer.

- Color Basic 1.1—Fully supports 64K and has an 8-bit serial printer routine for graphics.

- Color Basic 1.2—Executes code faster than previous versions, but changed the way the ROM reads the keyboard. This makes some software written for the older ROMs incompatible with the 1.2 ROM. There is a simple fix, which *HOT CoCo* incorporates into every program in which this problem is encountered.

If you don't know what Color Basic ROM version you have, type EXEC 41175 after you first turn on your computer. The ROM version will be printed on the screen.

- Extended Basic 1.0—Has bugs in the PCLEAR, PRINT USING, and DLOAD statements.

- Extended Basic 1.1—Fixes the above-mentioned bugs.

- Disk Basic 1.0—This is in the disk controller cartridge used with the grey CoCos and grey disk drives. The 1.0 Disk ROM is incompatible with CoCo 2's.

- Disk Basic 1.1—Works faster than 1.0, but you can use the 1.1 Disk Basic controller with the older, grey CoCos. Also, many routines have been moved, making some programs written using the 1.0 Disk ROM incompatible with the 1.1 ROM. (See "A Quick Fix for Your Disk ROM," by Mike Meehan, *HOT CoCo*, February 1985, p. 44, for a utility that overcomes this incompatibility in most cases.) ■



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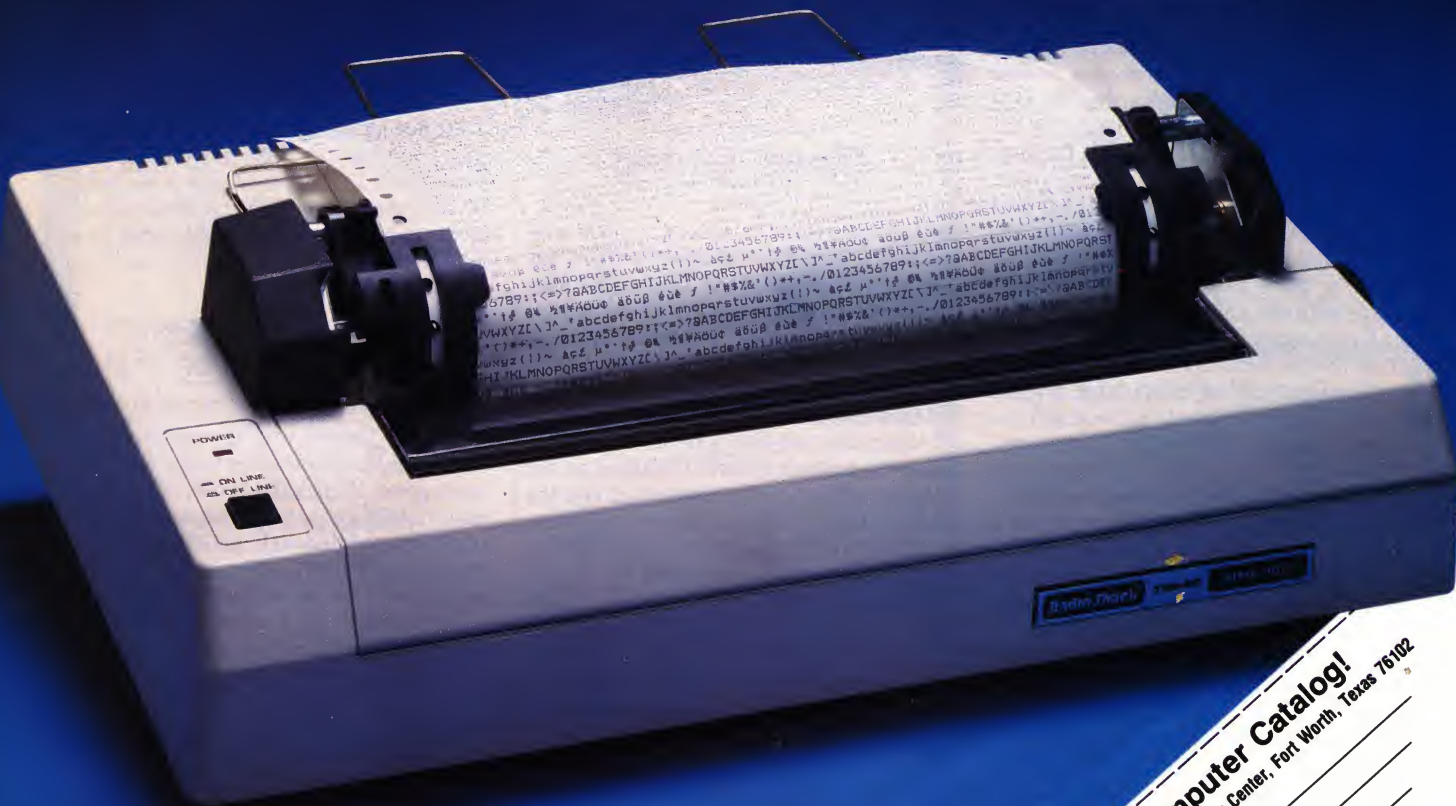
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# Letters to the Editor

Send your letters to Letters to the Editor, HOT CoCo, 80 Pine St., Peterborough, NH 03458.

## Grounded Ink Jet

I'm wondering if other people have had trouble using the Hi-Res Screen Print Utility (cat. no. 3121) with their CGP-220 Color Ink Jet Printer. My Radio Shack computer man and I have been unable to make it work. I hope someone can help us.

Your magazine is tops.

Richard Volans  
R 3, Box 255  
Ogdensburg, NY 13669

Hmmm. . . We've had no trouble using that combination. Is Richard's problem unique?—eds.

## Express Order Woes

Here's a response to your Digressions column on the success of Radio Shack Express Order.

I went to the local Radio Shack computer store, hoping to check out a word-processor program that was presumably OS-9 and Word-Pak compatible. They had a "demo" disk, which was not a demo at all; it merely showed the character display that the program used. The store had no manual for the product, nor were any personnel familiar with it.

After showing me the disk, which was much less explicit than the magazine ad, they pushed their express order scheme on me. If I'm going to spend \$70, however, I want to see a demonstration of what I'm getting for my money.

Your reviews are better than sales room demos, because your reviewers have at least used the programs. Nobody in the store I visited was familiar with Radio Shack's own OS-9. Unfortunately, I have not found one person in four Radio Shack stores who is familiar with OS-9, or Basic-09, which is a great program.

I own OS-9/Basic-09 and Word-Pak—a nice combination. I'm looking for a word processor as good as Telewriter-64 that will run under OS-9 and will use Word-Pak. I wrote to Elite Software about Elite-Word and received only copies of their ads in reply, so I am buying a manual. Maybe you will mention OS-9 and Word-Pak compatibility in a future review.

F.M. Walters  
Bethesda, MD

We share your concern about the lack of product knowledge some Radio Shack salespeople show. The main reason for this problem, we believe, is the sheer number of software and hardware products that a Radio Shack clerk has to sell. This gets magnified in small stores run by only two or three people. Our best advice is to do your business at the store that

knows the most about your computer.

The growing importance and popularity of both OS-9 and the 80-column cards such as Word-Pak dictate that we consider compatibility with them in reviews of all application software.—eds.

## K-Lock Revisited

I have enjoyed greatly Mr. Wuelzer's program, K-Lock (HOT CoCo, November 1984, p. 42). Having forgotten the password of an important disk, I have found an easy way to modify the program to automatically unlock a disk by reading the password off of the directory and by comparing it to itself. Just change line 01170 in the source code from LDA ,U + to LDA ,X + and change line 380 in the Basic program to:

```
380 DATA 166, 128, 177, 18, 134, 38, 80, 129
```

When the modified K-Lock asks for a password, press enter and the disk will unlock. Do not input anything except enter or the program will not unlock the disk.

Roy J. Finney  
Sugarland, TX

## Thanks, Selected

I have a two-year-old Color Computer with a 16K E board. As a Christmas present, my husband purchased a 64K upgrade kit from Selected Software, through an ad in your magazine. Not only did we receive the kit in less than two weeks, but the documentation that accompanied the product was excellent.

I have no previous experience in any form of electronics and was a bit nervous about doing the upgrade myself. I followed all the cautions offered in the cover letter and the upgrade was a total success. My thanks to the authors of the instruction sheets and the diagrams. Both were invaluable.

My thanks also to your magazine, which continues to bring useful information into my home monthly. I have been a subscriber since the very first issue. From the program listings to the reviews to the ads, it's a great magazine.

Donna J. Cole  
Westminster, CO

## Sloppy Syntax

I am a devoted reader, having enjoyed HOT CoCo almost since its inception. Your magazine is most enjoyable, and it makes more sense to CoCo owners than does any other magazine on the market. Keep up the good work.

Back when I cut my teeth in Basic, I became a stickler for proper syntax on a computer that was less friendly and less forgiving than Microsoft Basic is. If the syntax wasn't right, it would hiccup immediately.

To this end, I noticed that the syntax of some programs in HOT CoCo are a little sloppy. I have seen programs with two END statements and numbering that looks like unconnected subroutines strung together. In the Homespread program (January 1985, p. 30), a double FOR without a NEXT call appeared in lines 7110 and 7120. FOR. . . NEXT calls of this type will generally cause the computer to hiccup, forgiving though Microsoft Basic may be.

I realize that some of your inputs are from amateur programmers. I'm sure you'll agree, however, that messy programs should be cleaned up before publication. Errors of this kind are very discouraging to the novice programmer.

I don't mean to offend; I do mean to chide you into cleaning up your published programs. Then your otherwise fine magazine will approach perfection.

F. Armbrust  
Caribou, ME

Thanks for the criticism. Our first priority with programs is to make sure they work and are bug free. Frankly, this keeps us too busy to pay the attention we should to the details you mentioned. Your comments will make us try harder.—eds.

## Dragons, Yes— Bugs, Never

We were pleased with the comprehensive and favorable review given to our math facts maze game, Heroes and Trolls, in the March issue of HOT CoCo. Your magazine is exceptional in selecting well-qualified reviewers and in giving them sufficient space to thoroughly describe and evaluate a program.

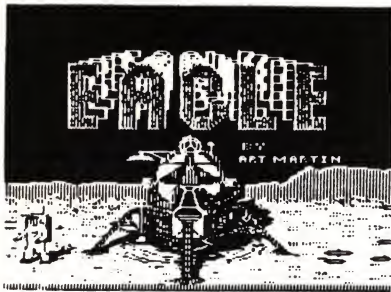
We were shocked, however, to read that "a few bugs cause the program to hang up or crash back into Basic every now and then." We do not put a program on the market without elaborate testing and debugging. Moreover, a large number of copies of the program have been sold and not a soul has written us with a problem—nor has a copy been returned despite our money-back guarantee on all our software.

After helpful and cordial discussions with our reviewers, we were able to confirm that the trouble was not with our program. So, let me reassure all potential buyers that Heroes and Trolls does not contain bugs that cause it to crash. We also must notify potential customers that the program is not for a 16K ma-



# Saguaro Software

## EAGLE



A graphic-enhanced lunar lander simulator. The pilot breaks out of lunar orbit and attempts a soft landing on the lunar surface. Joysticks control thrust and craft altitude and information is continually displayed on horizontal and vertical velocities, acceleration values, vertical and horizontal distances from target, fuel consumption and much more. On advanced levels, problems such as fuel leaks and computer screen failures can provide hair-raising final approaches. Disk version allows choice of landing site between Mars and Earth's moon. Takeoffs from the surface can be made and the upper stage placed back in orbit. The simulation is as educational as it is fun and exciting. A great tool for that future astronaut or physicist. 32K, 2 joysticks required. Available in tape or an enhanced disk version.

**Tape - \$24.95 Disk or Amdek - \$29.95**

## Sketchpad

Sketchpad is a graphics drawing program designed to provide the computer hobbyist with easy manipulation of the powerful graphics capabilities of the Coco. Advanced programmers can design graphics screens and characters for Basic and ML programs and games. Sketchpad was used to create the graphics for "Eagle."

Two joysticks control cursors that provide end-points and boundaries for lines, boxes, circles, ellipses and painting. Point-to-point drawings may be plotted on the screen and then rotated, enlarged or shrunk, moved or inverted. Patterns may be programmed in easily to create dazzling illusions using lines, boxes, circles, ellipses and drawings. Sketchpad supports all PMODES and color sets and gives false colors in Pmodes 1 and 4. Text and graphics can be combined on high-resolution screens. All pictures and drawings can be saved to disk for future use. 32K, 2 joysticks required. Disk only. \$29.95.

## Testmaker

Menu-driven series that creates mult. choice & T/F tests. Output to screen or printer. 32K Disk. \$29.95.

## Maycode

A 6809 disassembler. Reads & converts object codes to 6809 assem. Lang Mnemonics 16K min. Tape. \$24.95. Disk or Amdek. \$29.95.

## TDIR

TDIR is a menu-driven, user-friendly tape directory program. When installed and maintained on your cassette tapes, it allows complete directory control of your tapes. This means you will no longer need to go through a complete tape to discover that the program you wanted is on another tape. TDIR also eliminates the drudgery of trying to remember tape position settings, or program names. All this, and more, is controlled by TDIR. 16K tape. \$24.95.

## Alphacopy

It is nice to have an alphabetized disk directory, but if that should crash, it doesn't help tell you where the programs are. Alphacopy will fully alphabetize your disk; that is, write the programs in alphabetical order. Each program will be written on the same or consecutive sectors, thus making rebuilding of the disk much easier with the other currently available disk "zapping" utilities. ALPHACOPY will also allow you to format disks up to 80 tracks if your drive allows, thus giving you more space to store programs per disk. 32K. Disk or Amdek - \$24.95.

## The Digestive System

An educational quiz game for 2 players that covers different aspects of the human digestive system. Each question is assigned a point value relative to its difficulty. A fun way to learn about a not-so-fun subject. 16K.

## The Circulatory System

Using the same format as "The Digestive System," this program covers the heart, lungs, veins, arteries, blood, etc. 16K.

**Both Only:**

**Tape - \$19.95. Disk or Amdek - \$24.95.**

## Co-Co Receivables

Keep track of all those accounts with current list of accounts, statement printing, last activity date, and current month's transactions, debits & credits. Disk storage of data. 32K disk. \$29.95.

## Stars Of America

Education should be fun - this program is just that! This tutorial uses 25 of the superstars of American history, from George Washington to Ronald Reagan.

## The Civil War

A challenging two - person game. Questions cover Carpet Baggers to the Battle of Vicksburg. Points are assigned according to the difficulty of the question, scores are displayed throughout the game.

**Both Only: Tape 19.95. Disk 24.95**

## History From 1863 To 1976

On two 16K non-extended tapes. For 1-4 people. Informative & fun way to learn important dates in world history. Written for students by a teacher. Tape - \$19.95. Disk or Amdek - \$24.95.

## Treasure Hunt

A graphics text adventure. You walk with our graphics character through desert, mountains and city to seek the illusive treasure of gold. Super graphics with a person who walks with you at each turn. 64K. Disk & Amdek only - \$29.95.

## Loveless Manor

Trapped in a bedroom by your evil aunt, you've admired Queen Cinderella's castle in the distance... and you've just discovered she's a distant cousin. Can you escape to her protection? 32K. Great word adventure. Tape - \$19.95. Disk or Amdek - \$24.95.

## Raid On Burdanovka

Your mission, should you decide to accept it, is to steal Russia's newest weapon and save the world. Text adventure with 50 rooms. 32K. Tape - \$24.95. Disk or Amdek - \$29.95.

## Search For The Liangth

After years of study & searching, you have at last traced the alien race of Liangth to this valley. Now your quest for the power of Liangth begins! Tape - \$24.95. Disk or Amdek - \$29.95.

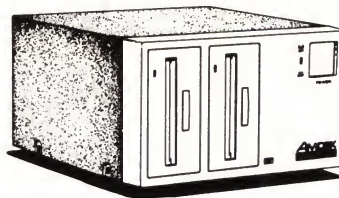
## OTHXO

Othello - machine language game for the 16K Ext CoCo. 2 modes of play - you against a friend or you against the computer. When playing the computer, it will play hard or easy. Object of the game is to change the opponent's spots to yours by placing your marker at the end of a row started by your marker. Not as easy as it sounds! Tape, \$24.95. Disk or Amdek, \$29.95.

## Co-Co Keno

Bring Las Vegas' Keno game home with Co-Co Keno. Bet \$1, \$3 or \$5 & mark off 1 to 15 spots...can you beat the odds & win \$50,000? 16K, high resolution screen. Keno chart print included. Tape, \$24.95. Disk or Amdek - \$29.95.

# Hardware, Too!

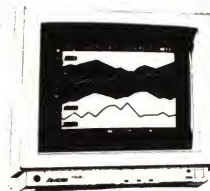


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Color 300

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MDP Universal Video Driver - \$25.95 With Purchase

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**AUTHORS! ASK ABOUT OUR ROYALTY PROGRAM**



## Letters to the Editor

chine, nor does it require a disk drive. It requires a 32K machine and is available on either disk or tape.

Once again, we would like to thank *HOT CoCo* and the Normans for their careful assessment of Heroes and Trolls. We absolutely agree with their judgement that "Heroes and Trolls is a fun application of math drills in an intriguing game setting."

Lynne Roberts

President

Cognitive Development Company  
Seattle, WA

## Clubhouse

Have a Color Computer club? Let prospective members know about it through a letter to the Editor.

## Northern New Jersey

It is with great pride that I inform *HOT CoCo*, and the Northern New Jersey area of a great CoCo club, "The Meadowlands Color Computer Club." We have something for everyone, and we support every 68xx-based system. Our meetings are presently being held at the Belleville Recreation Center, 407 Jouralemon St. For more information, call

Bill Coram, President (201-751-8953), Jason Goldblatt, Vice President (201-779-6142), or Dave McGuire, Secretary (201-338-6460).

Bill Coram  
Belleville, NJ

## Adventure Club

Help! A few CoCo owners here have decided to put together a pool of the solutions to as many adventure games for the Color Computer as we can get. We are asking anyone with any helpful hints, maps, or step-by-step solutions to contribute. This information will be available to anyone who writes to us for it. Please send your hints and help to Box 82, Oak Ridge, PA 16245. Any help will be appreciated greatly. Also, anyone needing help with an adventure might get some hints by sending an SASE to us at the above address.

Jim Gruver  
Oak Ridge, PA

## Vancouver VIPs

This letter announces the formation of a VIP Software User's Group. If you use any

Softlaw Corporation products (VIP Writer, Speller, Database, Terminal, Calc, or Zap) on a regular basis, let's hear from you. We will produce a newsletter containing tips and hints about how to use these programs more efficiently or in unusual and ingenious ways. If there is sufficient response, perhaps a dedicated BBS will follow.

If you are interested, send your name and address. Let us know which programs you use and what benefits you'd like out of a user's group. Also, please include \$1 to cover the cost of reproducing and mailing the first newsletter. Input for the newsletter will also be welcome.

Robert Silverman  
2885 West 30th Ave.  
Vancouver, BC  
Canada V6L 1Z1

## Auburn, NY

I would like to reach some prospective members for a CoCo user's group.

David Sullivan  
Box 407, RD #1  
Auburn, NY 13021  
315-253-4054

# SUPPORT

(sə-pôrt) v.t. **1.** To bear the weight of, especially from underneath; uphold in position; keep from failing, etc. **2.** To bear or sustain (weight; etc.) **3.** To keep from failing; strengthen: *PBJ, Inc. supports their product line with technical personnel that are always there to help you.* **4.** To serve, to uphold or corroborate (a statement, theory, etc.) substantiate; verify: *PBJ, Inc. receives testimonials on a daily basis that support their product line.* **5.** To provide (a person, institution) with maintenance; provide for: *PBJ, Inc. supports the CoCo user by consistently creating new advancements in their field.*

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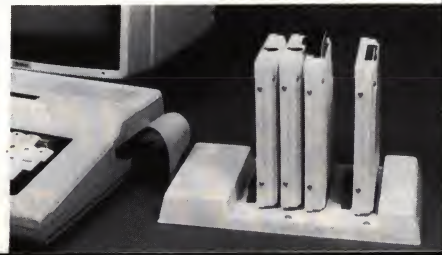
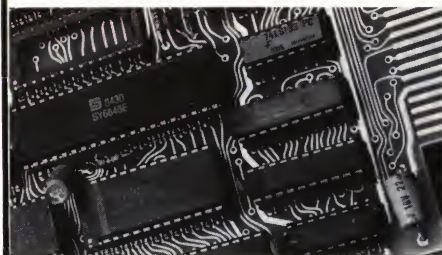
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\* Derived from Funk & Wagnall's International Dictionary





# Letters to the Editor

## British Columbia

We'd like to remind your readers about what we think is the friendliest club in North America, the North Island CoCo Club. We have a reading, a hardware, and a software library, a member-run BBS, and a monthly newsletter. We welcome any and all correspondence, so please drop us a line and see if we can't help you enjoy your CoCo a little more.

Ann Marie MacKay  
North Island CoCo Club  
P.O. Box 1740  
Port Hardy, BC  
Canada V0N 2P0

## Tallahassee, FL

The Big Bend Color Computer User's Group is starting over after moving into the Tallahassee area. Anyone interested should write to our editor for more information.

Ronald Majiros, Editor  
2506 Colleen Drive  
Tallahassee, FL 32303

ique. Appelez au numeros 418-872-8347.

Welly Denoncourt  
Ancienne-Lorette, Quebec

## Hitchhiker's BBS

The Hitchhiker's BBS of the Galaxy is on line 24 hours a day, every day. All users are welcome. Hitchhiker's BBS features uploading, downloading, three message bases, mail, and an on-line Dungeons and Dragons game.

Rodeny Schultz  
Philip Warner  
606 Carolyn  
Brenham, TX 77833  
409-836-3378

## On Line

Are you operating a BBS? Send us a note to let our readers know about your service.

## Kid CoCo Club

Here is a new CoC club just for kids aged 5-16. We won't have meetings, but we will have a monthly newsletter featuring contests, programs, and helpful hints on adventures. Members will submit newsletter ideas. Send an SASE for more information.

Derrick Kardos  
The CoCo Club  
11 Regal Drive  
Colonia, NJ 07102

## Quebec

I would like to announce a new BBS called L80C, dedicated to the CoCo. Features include a message base, electronic shopping, downloading, uploading, games, and graphics. Readers may call the BBS anytime at 418-872-8347.

J'aimerais vous annoncer un nouveau BBS, son nom est L80C, dédie spécialement au TRS-80 Couleur. Ses possibilités sont une système de messagerie, marchandise à vendre, uploading, downloading, jeu et graph-

## Infoex-80

Our new, 24-hour BBS is Infoex-80. It is not run specifically for the Color Computer, but as the SYSOP of the CoCo section, I have collected a good number of excellent programs that can be downloaded. We also encourage users to upload programs for other users to enjoy. The phone number is 205-887-7919.

Jeff Thorne  
Auburn, AL



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May 1985 HOT CoCo 15



# Doctor ASCII

by Richard E. Esposito and Ralph E. Ramhoff

**Got a problem with your Color Computer? Ask the Doctor to solve it. Write to Doctor ASCII, HOT CoCo, 80 Pine St., Peterborough, NH 03458.** Be sure to include a self-addressed, stamped envelope if you want a reply. Due to the volume of mail this column receives, we cannot guarantee that your question will be published.

**Q.** I have a CoCo with Color Basic 1.1, Extended Basic 1.0, Disk Basic 1.1, an E board, 64K of memory, and a Tandy disk controller and drive. I have a copy of VIP Writer that works fine, but when I try to copy it using BACKUP, I get an I/O error. The COPY command seems to work, but the resultant copy makes my computer go crazy. VIP Technologies suggested that I go to a Radio Shack store and test it on another system. Could it be a ROM or drive problem?—**Kenneth Weber, Ridgefield, NJ**

**A.** I agree with VIP. Trying the program on another system will tell you immediately whether the problem is with your hardware or the disk itself. If another system is unavailable, try using BACKUP or COPY on another disk that was not written on or formatted using your drive. If that works, my guess is that the VIP Writer disk is bad. If it does not, your drive might need alignment.

**Q.** I am thinking about adding an 80-column card to my CoCo. Is it hard to use with my existing software?—**Lawrence Myers, Silver Springs, MD**

**A.** PBJ (P.O. Box 813, N. Bergen, NJ 07047) markets Word-Pak I (\$119.95) and Word-Pak II (\$149.95). Double Density Software (920 Baldwin, Denton, TX 76205) markets Double-80-Plus (\$99.95). My personal preference is the Word-Pak I with built-in ROM. It requires either a Tandy Multi-Pak interface or PBJ's equivalent, and it gives you a menu when you turn on your CoCo from which you can select Flex, OS-9, or Basic. If you select either of the first two, Word-Pak I loads the appropriate boot followed by the DOS. If you select Basic, you get Tandy Basic plus a full-screen editor.

Word-Pak II lets you switch from the standard display to the 80-column display via software (loaded from disk or cassette) on the same monitor. Both PBJ products have their own built-in video RAM. Double-80-Plus is the least expensive, but it uses the CoCo's memory. Flex and OS-9 patches are available for all of the above.

Most machine-language programs do not work with these 80-column cards; most Basic programs that do not use graphics will work. Most Flex and OS-9 software was developed on machines with 80-column displays standard, and having 80-column capability on the CoCo is a real benefit when using this software.

**Q.** Is the CCEAD editor/assembler (Eigen Systems, P.O. Box 180006, Austin, TX 78718, \$6.95 cassette) worth the price, or should I buy a more expensive program?

Should I get a hard or floppy disk drive? What brand?

Can you suggest a good printer for under \$400?—**Alan D. Coons, Myrtle Creek, OR**

**A.** CCEAD is a good introduction to Assembly language, and since it is written in Basic, you can modify it easily. If you think you'll use Assembly on a frequent basis, you will probably be happier with Tandy's EDTASM+ or The Micro Works' SDS80C (P.O. Box 1110, Del Mar, CA 92014). The main difference between the two is that EDTASM+ uses a line-number-oriented editor while SDS80C uses a screen editor.

Hard disk drives are considerably more expensive, will not stand up to the abuse that a floppy drive will take, and are not easily backed up. I suggest you get a double-sided 40- or 80-track floppy disk drive. If Tandy isn't selling them yet, check out the ads in this magazine for other brands.

The Gemini 10X is probably the most popular non-Tandy printer for the Color Computer, and you can find them for under \$300. The Okidata Microlines are less popular, but have better print quality and cost a little more. "Printer Answers," *HOT CoCo*, March 1985, p. 24, tells you what to look for when shopping for a printer.

**Q.** I have a 64K Extended Basic CoCo and need information on relocating the video display.—**James R. Ballard, Titusville, FL**

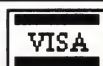
**A.** The following subroutine will put the CoCo's bit-mapped display at any point in memory with the restriction that it start at an address that evenly divides by 512 (e.g., 0, 512, 1024, and so on). The display will stay where you move it until your Basic program encounters a STOP or END statement. To use the subroutine, put the desired address in AD and imbed a GOSUB 1000 in your program.

```
1000 W1=AD/512
1001 POKE65478-((W1 AND 1)=1),0
1002 POKE65480-((W1 AND 2)=2),0
1003 POKE65482-((W1 AND 4)=4),0
1004 POKE65484-((W1 AND 8)=8),0
1005 POKE65486-((W1 AND 16)=16),0
1006 POKE 65488-((W1 AND 32)=32),0
1007 POKE 65490-((W1 AND 64)=64),0
1008 RETURN
```

**Q.** When I installed the upgraded keyboard in my F-board (285) CoCo, I discovered that the G and O keys would not work with a POKE 65495,0. Clipping some of the decoupling capacitors on the data bus, as recommended for some of the older models, did not



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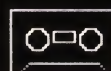
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## ROMMASTER

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If you wish you can burn your own EPROM's and have them available on power up at the flick of a switch. If you develop software for sale it is essential that your programs be tested on all versions and configurations of ROM's before you release them.



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solve the problem. I then discovered that with the joysticks unplugged, the G key worked. I have since replaced the 333 picofarad capacitors on the joystick sockets with smaller 33 picofarad capacitors on the joystick sockets C7 and C4, and I can once again use the POKE.

I tried to use the SDUMPX2 program from your December 1984 column (p.88), but my Gemini 10X printer skips carriage returns with this program, causing the picture to come out wrong.—**Rodger Alexander, Bellingham, WA**

**A.** Thanks for the keyboard information. The SDUMPX2 program was written for the older Gemini 10 printer. To modify it for the 10X, change line 410 to:

```
410 DATA 27, 90, 0, 27, 65, 8, 13, 255, 0, 0
```

**Q.** How can I tell if the system on which a Basic program is running is a disk system? How can I check to see if a certain file is on the disk?

When writing Basic programs on a 64K system, how can I tell if they will run on a 16K machine?

Is there CoCo software that lets you generate form letters and then merge information from another file?

I am in the market for a 300/1,200-baud modem and software to support it. What's the best?—**Raymond Ewing, Anaheim, CA**

**A.** Check PEEK(49152). If it equals ASC("D"), you have a disk system. Use a GOSUB to the following routine to determine if a file I\$ is on a disk.

```
999 REM REFORMAT FILENAME
1000 IF INSTR(1,I$,"/")=INSTR(1,
I$,".")=0 THEN I$=I$+"DAT"
1001 I=INSTR(1,I$,"/")=INSTR(1,I
I$,".") : FS=LEFT$(I$,I-1) : ES=RIG
HT$(I$,LEN(I$)-I)
1002 IF LEN(FS)<8 THEN FS=FS+" "
: GOTO1002
1003 I$=FS+ "/" + ES
1004 FOR I=1 TO 9
1005 REM SEARCH DIRECTORY FOR FI
LENAME IS
1006 DSKI$=17,2+I,FS(1),FS(2)
1007 FORF=1 TO 2
1008 FORJ=1 TO 97 STEP 32
1009 IF MID$(FS(F),J,1)=CHR$(255
) THEN GOTO 1016 ELSE IF MID$(FS
(F),J,1)=CHR$(32) THEN GOTO1013
1010 QS=MID$(FS(F),J+8,3)
1011 CS=MID$(FS(F),J,8) + "/" + QS
1012 IF CS=I$ THEN 1018
1013 NEXTJ
1014 NEXTF
1015 NEXTI
1016 PRINT "FILE NOT FOUND"
1017 END
1018 REM FILENAME FOUND - YOUR C
ODE GOES HERE
1999 RETURN
```

CLEAR200,16383 will effectively give you a 16K machine as far as Basic programming goes.

Elite-Word (Elite Software, Box 11224, Pittsburgh, PA 15238) has a "variable text option," which lets you write a form letter and have the computer fill in the blanks from a list in a second file.

The Hayes Smartcom II is the most popular 300/1,200-baud modem. My favorite terminal software is Colorcom/E, but check elsewhere in this issue for a wrap-up comparison of smart-terminal programs.

**Q.** I have a problem that relates to directly POKEing values to screen memory (addresses 1024–1535). If I POKE the ASCII values for the letters A to Z, they show up as expected, but when I

**18 HOT CoCo May 1985**

POKE the values for numbers or special characters, they show up in reverse video. Is this normal for the CoCo?—**Radames Aguayo Soto, Cayugas, Puerto Rico**

**A.** What you have encountered is due to the way Motorola designed the CoCo's 6847 video display generator (VDG). In order to have a character displayed for each of the 256 possible values (0–255), they rearranged some of the values. The POKE values 0–63 correspond to the following characters in reverse video:

```
@ABCDEFGHIJKLMN O PQRSTU VWXYZ
[\ ] ! - ' " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 ; < = > ?
```

The POKE values 64–127 correspond to the same characters in the CoCo's normal black-on-green display. The values 128–255 give you low-resolution graphics characters.

## Clarification

In a reply to Chris Webb in March's Doctor ASCII (p. 90), we stated that the CoCo's 6809E chip could address only 64K of memory at a time, even if you upgraded to 128K. Therefore, programs that require more than 64K must use bank switching. We felt that OS-9 would be a good candidate to support 128K, but we hadn't seen that combination when we wrote the reply.

We have since learned that DSL Computer Products Inc. (P.O. Box 1176, Dearborn, MI 48121) markets software with their 128K upgrade that performs bank switching. Also, R.G.S. Micro Inc. (759 Victoria Square 405, Montreal, Canada H2Y 2J3) markets OS-9 patches that work with their memory upgrade.

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On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

*...one of the best programs for the Color Computer I have seen...*

— Color Computer News, Jan. 1982

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### 64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

### RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

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Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

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Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

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by Richard Ramella

## A Sam Loyd Puzzle

**S**am Loyd was a master of confusion and America's greatest puzzlemaker. Born in 1841, he created many games during his 60 years that are still enjoyed today. You might have tried his most famous creation, The Fifteen puzzle. It places the numbers 1-15 on tiles that slide within a frame. One block remains open in all positions. The object is to move the tiles into numerical order.

After Loyd's death, Sam Loyd, Jr. published a giant collection of his father's work titled the *Cyclopedia of Puzzles*. The rare work is flawed because it was hurried into publication, but it remains the greatest single source of puzzles ever published.

My collection of more than 80 puzzle books contains many puzzles that can be traced back to Sam Loyd. This is in keeping with puzzle tradition, for in truth, Loyd did not hesitate to adapt material from the work of others.

The computer affords ways of enhancing puzzles. The puzzle in this month's column is adapted from the *Cyclopedia*—carrying on the puzzle tradition of "looting" from the past.

Also this month, there's a listing called Puzzle Contest I. Finding its solution could win you a one-year subscription to *HOT CoCo*.

### Connections

Figure 1 demonstrates the basis of Loyd's

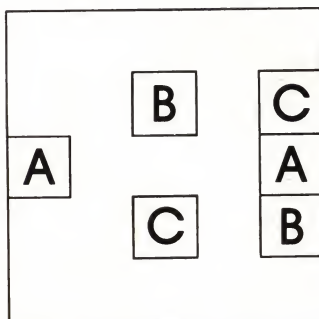


Fig. 1. Sam Loyd's First Puzzle

first published puzzle, which he wrote when he was 9 years old. It evolves from a story about three neighbors, A, B, and C, whose homes are within a walled area. After a falling out, they build enclosed paths from their homes to private exits (marked by the same letter). The trick is to connect A to A, B to B, and C to C without crossing any connecting lines. When you have solved the puzzle in Fig. 1, you'll be ready for the tougher version in Program Listing 1 called Connections.

When you run Listing 1, it draws five numbered boxes of different colors. In the bottom right corner there is a vertical bar made up of five small rectangles with colors matching the five boxes. Use the arrow keys to move the rectangles, which leave trails of their colors, to their corresponding boxes. Touch them directly to the numbers on the boxes.

As the program begins, the top rectangle on the vertical bar is flashing. When you touch it to its like-colored box, the second rectangle begins to flash. Keep connecting until all five boxes and rectangles are linked. The program does not allow you to cross a connecting line, leave the walled area, or go through boxes. If you trap yourself, press the break key and type "RUN" to start again. MC-10 users note the change in line 120; you must depress the control key to make your arrow-key selections work.

Next month I reveal a secret about Loyd's Fifteen Puzzle and present an Extended Color Basic graphics puzzle that goes beyond it.

### Puzzle Contest I

Bust minds with the best—if you can figure out the puzzle in Program Listing 2 and mail your answer to me on or before the end of the month, you might be the winner of a free, one-year subscription to *HOT CoCo*.

The object of the puzzle is to find five words connected by a shared theme. The first letter of these words forms an anagram for a sixth word with a related meaning. None of the words is apparent from the listing.

When you run the program, it draws a yel-

low frame, within which are three rows of four green blocks. At the top of the screen is a blue box. At the bottom of the screen is an orange box. To play, you use the arrow keys to move the orange box within and around the 12 green boxes to a position directly below the blue box. When the orange box touches the bottom of the blue box, a number from 1 to 5 appears on the right side of the screen followed by a "word," which corresponds with the route you took through the maze of green boxes. At the end of each turn, the orange box returns to the bottom of the screen where you begin your next of five turns.

Experimentation is the key to solving this puzzle. You will probably have to complete the puzzle's five turns many times to find all the correct words. If you take too many twists and turns through the maze before touching the blue box, the program could crash because of an OS error—start again. If you find the five correct words, you should have no trouble rearranging their first letters into the sixth, related word. ■

*Ed. note—To enter the contest, type or print your name and address on a sheet of paper. List the five words you found and the sixth word you formed from their first letters. Mail your entry to Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926. To be considered, entries must be postmarked by May 31, 1985. The entry with the greatest number of correct words will be the winner. In case of a tie, the winner will be determined in a fair and random manner. The winner's name and the solution to the puzzle will be published in HOT CoCo.*

See program listing on page 52.

**System Requirements**  
**MC-10 or Color Computer**  
**16K RAM**  
**Micro Color or Color Basic**



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## Real Talking

by Stuart Hawkinson

	construction quality	documentation	set up	performance	ease of use
6					
5					
4					
3					
2					
1					
OVERALL RATING 4.5					

Hardware

Famous computers, such as HAL from the film *2001: A Space Odyssey*, SAL from *2010*, and the ship's computer on the TV show *Star Trek*, have synthesized voices. So it seems the natural progression of things that your computer should speak in response to your commands. The speech afforded the Color Computer by RealTalker sounds like the stereotypical portrayal of robots in the movies. While Real Talker's speech might not be quite as refined as C3PO's, it is certainly more intelligible than the squeeks and squeals of R2D2 and others.

Real Talker hardware comes in a standard ROM-pack cartridge. The accompanying software extends Color Basic by adding a SAY command that converts words into phonemes, elementary sounds that the voice synthesizer puts together to form words. Phonemes are short codes that represent elementary speech sounds. (For example, "hello" is represented by these phonemes: H, EH, L, O, U1.) Real Talker has a text-to-phoneme editor for custom tuning speech patterns. It lets you compile the resulting phonemes into a stand-alone Basic program for merging with a Basic application.

### Hardware

Real Talker is based on the Votrax SC01 voice-synthesizer chip. The SC01 is the basis of many computer magazine projects for adding speech to a computer. The original Votrax synthesizer box cost about \$500 and plugged into a standard RS-232 port. Real Talker makes a perfect match to the CoCo's expansion port at a price not much greater than the current cost of the chip (about \$40).

The SC01 chip interfaces easily to most systems. Real Talker employs a simple address-decoding scheme, using three additional integrated circuits. The SC01 phoneme functions are available by POKEing codes to address 65410. The SC01 responds

to 64 phoneme codes, including most essential speech sounds, plus several pauses. Three higher pitches are available by adding 64, 128, or 192 to the phoneme code. The sound produced by the SC01 is routed through the normal sound output of the CoCo.

The Real Talker cartridge plugs directly into your CoCo's ROM-cartridge slot. Disk-drive users need a Y-cable adapter or a multiple ROM-pack interface. CoCo 2 owners plug a power supply into the Real Talker ROM pack that provides the balance of the +12 volts used by the CoCo 2's disk drive. Radio Shack's Multi-Pak Interface supplies that voltage internally.

### Software

Real Talker software is convenient to use. After you load and execute the Realtalk program, the text-to-phoneme program automatically loads into protected memory. The program requires 7K of RAM and adds three new features to the existing Basic interpreter. The new SAY command produces voice output directly from a Basic program. Use the simple listing that follows to experiment with text-to-speech conversion.

```
10 LINEINPUT "ENTER TEXT:"; A$
20 SAY A$
30 GOTO 10
```

The SAY command must be the only command on a line. You can also use it in the direct mode to produce voice output: SAY "HELLO, I AM YOUR COMPUTER." You vary the pitch of the sounds by setting

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the values 0, 1, 2, 3 to the variable PITCH.

The CONVERT command is a powerful feature of Real Talker's software. CONVERT produces a stand-alone program from your SAY commands. The resulting Basic program is an ASCII data file that you can merge with other Basic programs. The SAY commands must act on literal strings in quotes, such as SAY "HELLO," instead of a string variable, such as SAY A\$. The conversion lets you reclaim the 7K of RAM occupied by the text-to-speech software.

Another program, ASCItalk, recites your ASCII disk files. They might be any ASCII format files produced by a word processor, database program, or other text-editing program. The results, however, are imperfect. Many unexpected differences between written and spoken text arise.

The process of converting written to spoken words requires some human intelligence. The Textphon program that comes with Real Talker edits the phonemes produced by the text-to-speech algorithm. You can list the resulting series of phonemes on the screen, send their values to a printer, or convert them to a Basic program. You can also load converted strings from disk for more editing. The documentation has a page that describes the 64 available phonemes, but a tutorial on phonemes would be a good addition to this package. You will need to experiment to see how they all fit together.

### Talkhead

Colorware offers a separate program, Talkhead, that animates the output from Real



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Talker. It requires a 64K CoCo for high-resolution graphics, sells for \$19.95, and runs on cassette or disk. Talkhead produces images of a male speaker who makes facial expressions that coincide with the words from the synthesizer. Talkhead can be a little unnerving because the synthesized voice and digitized movements have an other-world flavor that has a chilling effect on some people. Talkhead is not for everyone. If you are interested in a novelty, something a little surprising to show your friends, it makes a good one.

## Having Fun

The Real Talker text-to-speech algorithm anticipates most English speech patterns. It also translates certain characters in useful ways. For example, text that contains a \$ is spoken "dollars" by Real Talker. It speaks a number, such as 12,345, as "twelve-thousand, three-hundred, and forty-five." It pronounces "cents" for digits following a decimal. Letters separated by spaces it calls by

their alphabet names. It also says the words for all the keyboard's math symbols.

Many English words have more than one pronunciation, determined by context. Real Talker says these words, such as wind, read, and tear, in only one way. To ensure correct pronunciation, you must deliberately misspell the word. For Real Talker, to speak "the wind blows," you must type "the winnd blows." However, "wind up the clock" sounds fine. To get a more natural sounding output, you will want to experiment in some instances. For example, I found that "micro-computer" sounds better when spelled "my crow cumpewter," and "Colorware" sounds best as "Cullerwair."

Some unexpected pronunciations could challenge your ingenuity. My son's spelling program asked us to spell what sounded like "koh." The word it was asking us to spell was "cow." Typing it as "couw" finally solved the problem. The moral of the story is that when you use a spelling program with Real Talker you must have two lists: one that

correctly spells the words and one that correctly pronounces them.

## Summing Up

Real Talker gives you a high level of interaction with your Color Computer. Its hardware is well constructed and compatible with all models of the CoCo. Its software is very well written, convenient to use, and produces stand-alone routines for your specialized applications. The SAY and CONVERT commands the package adds to Basic are a great improvement on an earlier version of this program. ■

*Real Talker is manufactured by Colorware Inc., 78-03 Jamaica Ave., Woodhaven, NY 11421, 718-647-2864. Real Talker requires 16-64K and runs on cassette or disk. It costs \$59.95 (\$64.95 for a CoCo 2).*

# The TRS-80 Electronic Book

by Richard Ramella

	construction	quality	documentation	set up	performance	ease of use
6						
5						
4						
3						
2						
1						N/A
OVERALL RATING 5.5						
Hardware						

The TRS-80 Electronic Book was designed as a child's interface device. It is a three-ring binder that has 12 large, numbered, touch-sensitive boxes. It connects to the Color Computer via a five-foot long cord that plugs into the right joystick port. When you touch one of the 12 boxes, the computer registers your input as a joystick reading.

The Electronic Book serves as hardware support for six software programs that Radio Shack will be selling separately. Only one of these programs, Professor Pressnote's Music Machine (see the review that follows), is available at this writing. All the software packages have overlays that convert the Electronic Book into a program-specific tool. The overlays or templates fit into the binder and cover the 12 touch-sensitive boxes.

The Electronic Book enhances the advantages of the computer in two interesting ways. It provides small children, who have not yet developed good muscle coordination

in their hands, with simple choices and large areas to press for results. When combined with the software, the Electronic Book also makes using the computer more interesting by adding colorful book activities to its screen graphics, sound, and characters.

The templates that come with the software for the Electronic Book can represent many things: space travel, musical notes, mazes, spelling bees, math games, and so on. The Electronic Book gives the Color Computer 12 special function keys whose effects are as good as the programmer's creativity and imagination.

## Other Uses

An intermediate programmer could use the Electronic Book to create games and educational activities. The product could also have applications for the physically disabled. It does not come with programming information, but if you are interested in doing your own programming in Basic, the information that follows might be helpful.

The Color Computer's joystick port can read Cartesian coordinates ranging from 0 to

1: 63/0	2: 52/0	3: 41/0	4: 7/0
5: 18/0	6: 29/0	7: 0/63	8: 0/53
9: 0/41	10: 0/7	11: 0/19	12: 0/30

Table 1. Electronic Book Joystick values



The TRS-80 Electronic Book

63 across and down. In a brief and lucid section, your CoCo manual explains how to use them. The following listing determines the joystick values for each of the 12 numbers of the Electronic Book.

```

120 IF JOYSTK(0) < > 0 OR JOYSTK(1)
    < > 0 THEN GOSUB 140
130 GOTO 120
140 F$ = STR$(JOYSTK(0)) + STR$(
    JOYSTK(1))
150 PRINT F$: RETURN
    
```

Table 1 shows the values the listing finds. The first number is the Electronic Book box number. The second number is the JOYSTK(0) value. The third number is the JOYSTK(1) value. Knowing these values



gives programmers the ability to make pressing a given box cause particular events to occur in their programs. The value of this product to programmers goes far beyond its prescribed uses. You can write a program and define the 12 touch-sensitive areas as you wish by making your own full-page template. The overlay might represent numbers, letters, colors, countries, directions, math functions, rainbows, elves, or anything that you can put into a program. It's a natural for classroom use.

## Performance

The touch-sensitive area of the *Electronic Book* is covered with seamless vinyl. It is the perfect medium for easy cleaning of peanut butter, jelly, and other goopy materials that might find their way onto the fingers of children. The book is safe to use. It is never in contact with dangerous electrical current. The *Electronic Book* has no documentation, but it needs none. A child knows instantly what to do—just press.

The only drawback to the *Electronic Book* is that it sometimes responds to input sluggishly. A firm pressing motion is necessary

to ensure contact. Some areas of the touch-sensitive boxes require greater pressure than others, which could result in a frustrating experience for some children. You might want to ask a Radio Shack salesman to set up the *Electronic Book* for your child to try out in the store.

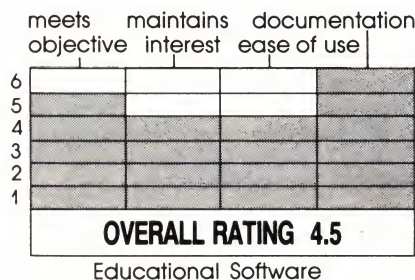
## Summary

The initial investment for the *Electronic Book* and its software might seem steep, but in many cases it is no more expensive than the educational packages offered by other companies. The *Electronic Book* has a great deal of potential for education. What remains to be seen is the value of its software. Despite a minor performance shortcoming, the *Electronic Book* is a well-conceived educational device. It also offers interesting possibilities to programmers. ■

*The TRS-80 Electronic Book is manufactured by Tandy Corp. (Catalog No. 26-3141), 1400 One Tandy Center, Fort Worth, TX 76102. It requires 16K and runs on cassette or disk.*

# Professor Pressnote's Music Machine

by Richard Ramella



Although infants usually enjoy singing along before they learn to talk, many parents who seek to provide their children with a musical education encounter reluctance. Kids usually avoid practicing a musical instrument in the same way they resist many other disciplines that put work and order into their lives. In other words, for many kids, fingering piano scales is as onerous a chore as cleaning a room.

Many adults can relate queasy musical memories: the burdensome tuba carried home from school through the drifting snow, the clamorous cherrywood upright in the playroom, the rusting Fender in the basement. Some might even remember abandoned dreams of musicianship wistfully, wishing their parents had forced them to

keep taking lessons, imagining to themselves, "I might have been another Val Cliburn or at the very least a sideman with Twisted Sister."

## The Key

Professor Pressnote gently and playfully teaches kids about music. The program reveals the working relationship between printed notes and the music they represent. It works with a hardware device called the *TRS-80 Electronic Book* (see the preceding review), which is sold separately. The *Electronic Book* serves as hardware support for an educational series of six software packages that includes Professor Pressnote. The other programs are Solar Explorer, Word Wizard, Shape Maker, Maze Master, and the Number Factory. They cost \$19.95 each and as of this writing have not yet been released. Each program comes with a series of pages that overlay the touch-sensitive numbers on the back cover of the *Electronic Book*.

Professor Pressnote has six activities, one for each page overlay. All the activity pages have an on/off button. Pressing it begins or ends the activity. The illustrations on these pages are colorful and inviting.

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while the screen indicates the notes on a musical staff. Pressing any one of the three large notes triggers a brief recital of a well-known melody. Note Finder displays a treble clef and the ascending scale. Pressing a note from C to B plays it, reverses its color on the screen, and prints the letter below the note on the scale. Length Maker introduces the concept of musical time, letting players explore whole, half, quarter, and eighth notes while assembling short musical scores on screen that they can replay. Tone Machine lets players try tunes by ear while indicating the notes played on the staff. Copy a Tune lets players copy up to four staves of notes from sheet music. The accompanying manual offers many tunes for practice. The last activity, Quizzes, features two tests, Name the Notes and Add the Lengths. The latter probes the math of eighth and quarter notes.

The Professor Pressnote manual provides workbook activities. It also gives permission to duplicate its "concept and review" pages for home or school use. It is a concise manual

that is written primarily for adults. That's because the *Electronic Book* and the software and colorful templates of Professor Pressnote's activities are all a child needs to make the program work without frustration.

## Well Versed

Most kids are apt to gain an understanding of scales, notation, and musical time simply by playing at the different activities of Professor Pressnote. The arrangements of notes on the templates do not directly correspond to any common instrument, so there is nothing to unlearn if a child goes on to play harp, trumpet, piano, or banjo, for example. But the program introduces children to the basics of reading music.

Professor Pressnote could be an intellectual start toward a career or pleasurable avocation for kids who are natural musicians. These are easy to spot. They crawl toward the guitar in the corner as infants. They belt out show tunes in harmony at the age of four.

Later on, they wrench simple melodies out of harmonicas during the first moments of ownership. For these children, Professor Pressnote introduces the concept of the union of music and mathematics, and clearly demonstrates the correlation between the written and played versions of melody. And it lets children experiment to create music as they hear it.

Most preschool to elementary-school-age children will enjoy this program while learning even if they don't ultimately pursue music except as listeners. This makes Professor Pressnote a hit. ■

*Professor Pressnote's Music Machine is manufactured by Tandy (Catalog No. 26-2573), 1400 One Tandy Center, Fort Worth, TX 76102. It requires the Electronic Book (Cat. No. 26-3141, \$24.95), 32K, and cassette or disk. It sells for \$24.95.*

## The Wiz: CoCo Solver and Program Generator

by Gary W. Clemens

	ease of use	documentation
performance	error handling	
6		
5		
4		
3		
2		
1		
OVERALL RATING 4.75		
Application Software		

**C**oCo Solver is a unique set of programs that might be the most versatile package ever developed for the Color Computer. The program is an equation generator, a miniature data-file manager, a programming tutor, and an advanced programmable calculator. But CoCo Solver is more than this, it is almost a computer operating system. It supports all primary functions, including cassette and disk I/O (input and output), generates program subroutines by writing new code, and gives you the freedom to be creative without the drudgery of writing a line of program code for screen, printer, and I/O handling.

The disk version of CoCo Solver is nearly the same as the cassette version, reviewed on p.92 of the November 1984 issue of *HOT CoCo*. Program author David Jackson updated CoCo Solver to make it easier to use. The disk version also has several additional function modules, which are examined in this review.

Program Generator is a separate package that creates stand-alone software to your specification from data files produced by CoCo Solver. The potential of this program conjures the image of instant programming; perhaps someday everyone will program simply by typing in what they need.

## CoCo Solver on Disk

Disk CoCo Solver provides a number of utilities for expanding the variety of options it offers. Some of the utilities you load from within the program, and they function similarly to a template. Others are short sections of Basic that are merged with the main function module of the program, EQN (equation), actually overwriting segments of it.

The package includes utilities that copy, erase (deleting all input with a single command), "kill" files on the data disk, sum a page, and move a single category and a mini monitor to PEEK at memory, among other things. CoCo Solver also has routines that open and close data files and read ASCII files. The merge utilities include cassette read and write routines, disk read and write routines, and memory-size modules. The memory modules relocate EQN (which controls the display) in memory so that you can use graphics pages, merge other programs with EQN, or create room for other specialized uses.

CoCo Solver comes with two teaching programs written in Basic. They explain each operation of EQN and show on-screen ex-

amples of what you do at each step. The texts for these tutorials are not included in the user's manual, but you can list them to get print outs.

"Teach" is a tutorial written for people who are unfamiliar with the concept of variables. It begins by explaining and demonstrating the use of letters for representing numeric values or alphabetic statements. It duplicates the manual in some areas, but does so in a way that reinforces the material.

The other teaching program, "Instr," is designed to explain how to use the merge modules. It covers some common situations in which you might need to make use of various modules. The author includes a section that explains how to write your own modules for special applications.

Several of the example templates are also tutorials that use a definition to explain a concept. They provide hands-on practice by guiding you through the procedures they address.

CoCo Solver's disk I/O functions work exceptionally well. You can select any drive from within the program, list a directory of any drive, and use any extension name. If you have forgotten the name of the file you want, you can call a directory that stays on the screen. EQN redisplay the prompt and waits for you to enter the correct file name or return to the main menu by pressing the enter key. The only activity you can't precipitate through the I/O routine is getting free granules left on the disk. EQN defaults to the extension DAT on your file names if you for-

*Continued on page 70*



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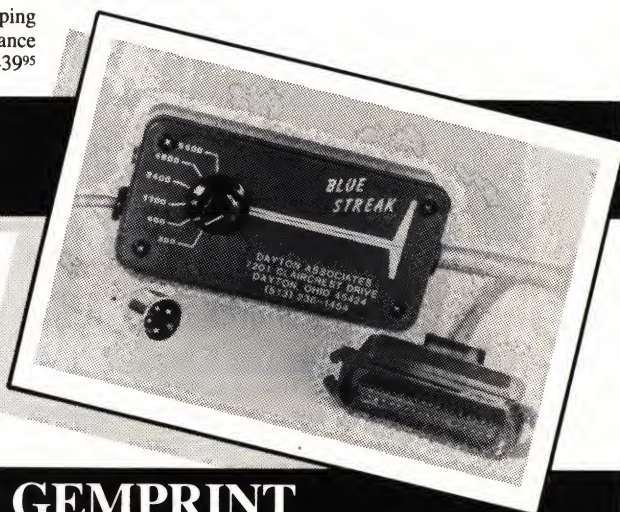
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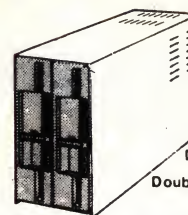
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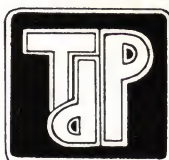
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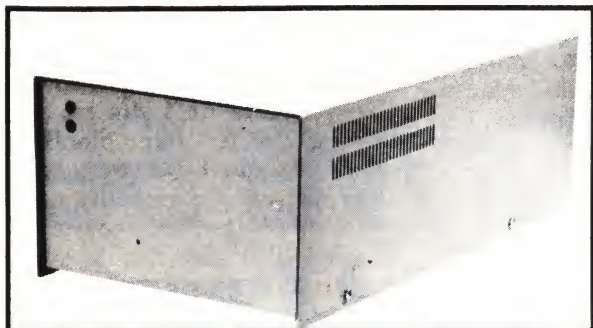
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# Smart Terminals for the Disk Drive Set

## Who has the smartest terminal software for you? **Part II**

*Eds. note—Last month Jeff Parker looked at the disk versions of VIP Technologies' VIP Terminal, Computerware's Color Connection II, and Eigen Systems' Colorcom/E. This month he concludes the series with an assessment of the disk versions of Cer-Comp's Data Pack II and PXE Computing's Autoterm. The cassette versions of these programs were reviewed in the August and September 1984 issues of HOT CoCo.*

	ease of use	documentation
performance	error handling	
6		
5		
4		
3		
2		
1		
<b>OVERALL RATING 4.75</b>		
Application Software		

### Data Pack II, v. 2.2

**D**ata Pack II by Cer-Comp has features that none of the other programs can claim. It is compatible with PBJ's Word-Pak 80-column card, Radio Shack's Deluxe RS-232 Program Pak (Cat. No. 26-2226) and PBJ's 2SP-Pak dual RS-232 cartridge. Support for these products includes terminal options for baud rates from 50 to 19,200 baud.

Cer-Comp added several features to this latest version of Data Pack II, including xon/

xoff features for uploading and downloading, and a capacity to accept all forms of incoming data with the binary option. This version of the program also has an autolog processor that allows you, for example, to preprogram access to a BBS or on-line service. Cer-Comp provides a new 13-page booklet to help you

**"Data Pack II is a full-featured, well-designed, easy-to-run terminal package."**

use the autolog feature. If you are using an older version of Data Pack, it might be worth your while to consider taking advantage of Cer-Comp's generous upgrade policy to get this newer version. Cer-Comp will upgrade your old version of Data Pack and its manual for \$5-25, depending on the complexity of the upgrade.

Data Pack II is not a menu-oriented program. It is, however, designed for easy use. In the command mode, you rarely need to type more than two characters for each command. The help menu is simply a list of commands and their functions. You access it from the command mode by pressing the enter key.

Data Pack II has one of the best error-handling routines available from any of these smart terminals. It is a fairly fail-safe routine. If you type a value for a given function incor-

rectly, the program lets you know and waits for the appropriate value.

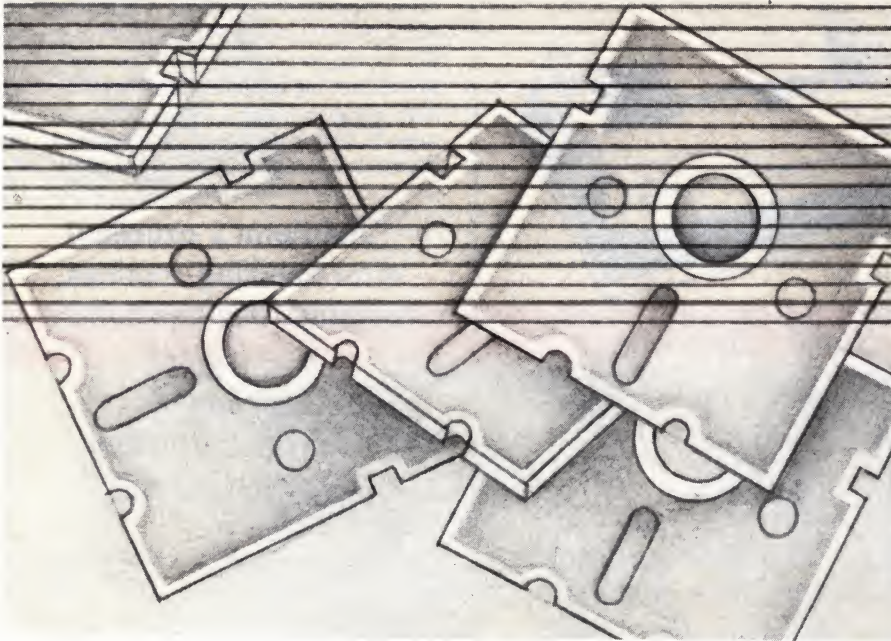
The program also reassigns the role of the reset button, making it fool proof. Pressing the reset button from any mode exits you back into the command mode, with no loss of data from the buffer. This prevents the kind of frustration incurred by programs that are not so well error-trapped; you have to work at it to lose data with Data Pack II.

Despite Cer-Comp's thoughtful error trapping, there is one way you can create a problem for yourself. Typing "BA" exits the program back to Basic without saving the buffer. All information currently in the program is lost, too. Cer-Comp should consider an error-handling routine for this aspect of the program. Users need the chance to confirm an exit to Basic before it takes place because they might have issued the command accidentally.

Data Pack II allows unlimited buffer size for nine PKs (programmable keys). These buffers can hold a one-character entry or the entire *Declaration of Independence*. And they can be sent with only a few keystrokes. Because Data Pack II has a complete buffer-editing feature, it is possible to edit PK buffers from within the program. The computer stores PK buffers on disk as files and loads them when you call for them.

Included in Data Pack II is a text buffer with an editing routine. The editor is simple but useful. In addition to some scrolling and line-jump capabilities, the editor has insert and delete functions. It does not have search, locate, change, or other extras found on word processors, but as a functional editor that





you use just before sending or after receiving buffer files, it is effective and easy to use.

The documentation that comes with Data Pack II is straightforward. It covers every command and subcommand with an explanation and example. It complements the program because it is also easy to understand.

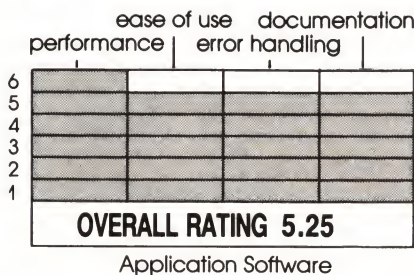
This terminal's high-resolution display comes with enough screen-size options to satisfy the most demanding user. I found black characters on a green background the easiest format to read. As you might expect, Data Pack II runs slower in the high-resolution mode than in low resolution (the standard 32-column by 16-row display). The 255-column display option offers a way to make graphs easier to read because you can fit them on one screen. The only annoying aspect of the program's high-resolution mode is that its manufacturer's logo takes up five lines at the top of the screen. If something must usurp that space, it should be a status line indicating the available buffer space and the current operation mode.

One of the more helpful features of Data Pack II is the GS (general status) display, which keeps you informed about the current settings of all the communications protocol including printer baud rate, available memory, and memory in use.

Data Pack II is a full-featured, well-designed, easy-to-run terminal package. The data uploading and downloading functions have been enhanced in this version to handle a wider variety of systems. The edit buffer is handy for pruning out odd bits of unneeded information before printing. Data Pack II's compatibility with several third-party pro-

ducts and its orientation toward simplicity and ease of operation make it one for serious users to consider.

*Data Pack II is manufactured by Cer-Comp, 5566 Ricochet Ave., Las Vegas, NV 89110, 702-452-0632. It requires 32K minimum (or 16K for low-resolution). It costs \$44.95.*



## Autoterm, v. 3.1D

Autoterm's packaging claims that the program is the world's smartest terminal. And it is the smartest and most powerful terminal program that I have come across in the world of the CoCo. It would be difficult to describe all the programming wizardry that went into the creation of Autoterm. Philip Zwart and Jim Whitaker spent more than two years creating the program, and that hard work is evident. Autoterm provides enough features to intrigue professionals and hobbyists alike.

Autoterm has three primary modes of operation: text editor, intelligent terminal, and KSM (keystroke multiplier) definition. It's easy to create a 14-line bounce or a short loop

that executes with a keystroke by programming KSMs. And they can be fairly extensive because they are held in the edit buffer. Another interesting feature of Autoterm is the append function, which lets the program handle files that are larger than available RAM. Autoterm makes periodic saves of the buffer through the use of a maintain command, adding new data or appending an existing file. Autoterm also lets you enter the command mode while on line, allowing you to change functions while a host computer stands by.

Autoterm has the most sophisticated text-editing buffer of the programs examined in this two-part review. Some of its main features are key-press and error-warning tones, search, define, insert, and delete. It gives you the choice of eight character sizes and column widths. The high-resolution display is well formed and easy to read on a monitor. You can save, store, delete, and transmit all text-editing functions, and all of Autoterm's functions work in the text buffer.

Another user-controlled function of the text editor is its formatting capability, which overrides the width of incoming data or text and lets you define page size, width, characters, line feeds, line spacing, the use of control characters, word-wrap, and so on. Autoterm is not a full-featured word processor, but it comes very close. Whether on or off line, it can edit, print, or transmit a buffer you have received or plan to send in any way you want—very smart, indeed.

In the intelligent-terminal mode of Autoterm, you'll be hard pressed to remember that you are not using some far more powerful and expensive machine. Autoterm has several features, such as on-line editing, cueing, and reviewing, that the other terminal packages don't have. They allow the computer to receive information in its buffer while you edit it, on line, at the same time—with no loss of data. There also are many ways you can define scrolling. For example, you can have the program scroll through screens as you receive data or "toggle" it off so that the program brings each new "page" to the top of the screen all at once.

The KSM definition mode might be the true core of Autoterm. It lets you define any number of KSMs, of any length and complexity. A series of special editing commands and command formats for this mode is clearly outlined by the manual. If you have a smart modem (one having autodial or autoanswer), the KSM definition mode gives you the option of having the computer complete its own log on and log off. This kind of automation is available from only one other program in this review, Colorcom/E, which was examined last month.

In comparison with Colorcom/E, Autoterm does not have the ability to set a software





## DAISY WHEEL

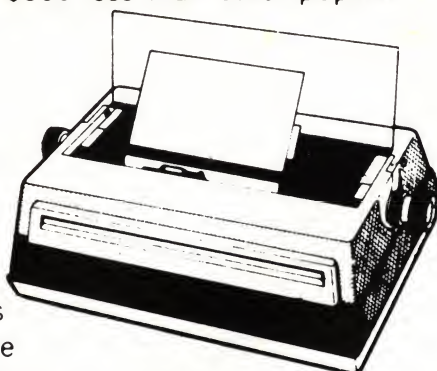
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clock for performing a log on at a preset time. It does, however, have more capabilities for sophisticated computer dialogue than Colorcom/E. With the automode, which you construct from KSM files using a special series of wedge-notation commands (such as scl for shift-clear), you can program the computer to conduct log ons and await information from a host computer. Programming in automode can also direct the computer to choose an alternative if it does not encounter

**"Autoterm's excellent error-handling routines, thorough documentation, and logical, easy-to-use command structure make it stand out."**

a specified response from a host computer. This is called branching and is the most sophisticated kind of automation currently found on the Color Computer.

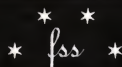
A good example of branching is the message-taker program described in detail in Autoterm's manual. It allows the computer to answer the phone with an autoanswer modem and take messages from another computer. You might also program the computer to retrieve a stock report from Dow Jones, pick up mail waiting for you on a BBS, or perform any of several hundred similar activities. It is also possible to program time-delay loops. You can, for example, create a delay between the output of program lines or reception of input lines to match the needs of a host computer.

The documentation that comes with Autoterm is some of the best I've seen. The manual is clear cut and well written. It gives an explanation and example of each function and often offers the reader a chance to practice programming an example directly on the page—a learn-by-doing approach that few manufacturers provide. It has several appendices with technical information and command summaries, as well as a fully cross-referenced index. It's the finest manual of the five programs in this two-part review.

The few minor details missing from Autoterm are more than made up for by its many powerful features. Its excellent error-handling routines, thorough documentation, and logical, easy-to-use command structure make it stand out. In the world of Color Computer smart-terminal packages, Autoterm is a class act. ■

*Autoterm is manufactured by PXE Computing, 11 Vicksburg Lane, Richardson, TX 75080, 214-699-7273. It requires a minimum of 32K and sells for \$49.95.*

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# ***Digitize Me!***

***Change your voice  
to binary numbers and back again.***

**O**f the Color Computer's many abilities, one of the lesser known is that it can digitize sound (change sound into binary numbers that the computer can process). Hardware-based voice synthesis is somewhat expensive, but my system uses only software.

The part of the program that produces speech is only 173 bytes long. It can mix or repeat parts of words that are in its 16-second digitization buffer; although it is limited to producing the sounds stored in the buffer, you can easily set up special words to use in particular programs.

My method is not as versatile, nor does it produce sound as clearly, as hardware-based speech synthesis, but you can use your own voice and experiment to get the most understandable words. You can add your voice to any Basic program that doesn't use too much memory.

## **Using the System**

There are two parts to the sound-digitization system. The first, and most important, is the machine-language portion (Program Listing 1) that reads sounds from cassette, stores them, and repeats the sounds later. The second part is a Basic program (Program Listing 2) that uses the machine-language program and lets you experiment with the sounds you store.

Begin by entering Listing 1, using an assembler. If you don't have an assembler, Program Listing 3 is a Basic program that POKEs the machine-language program into memory and saves it. Now carefully type Listing 2, Digitize.

When you are sure you've typed the listings correctly, save them and then record your voice on cassette. With the machine-language and Basic programs (Listings 1 and 2) in memory together, run the

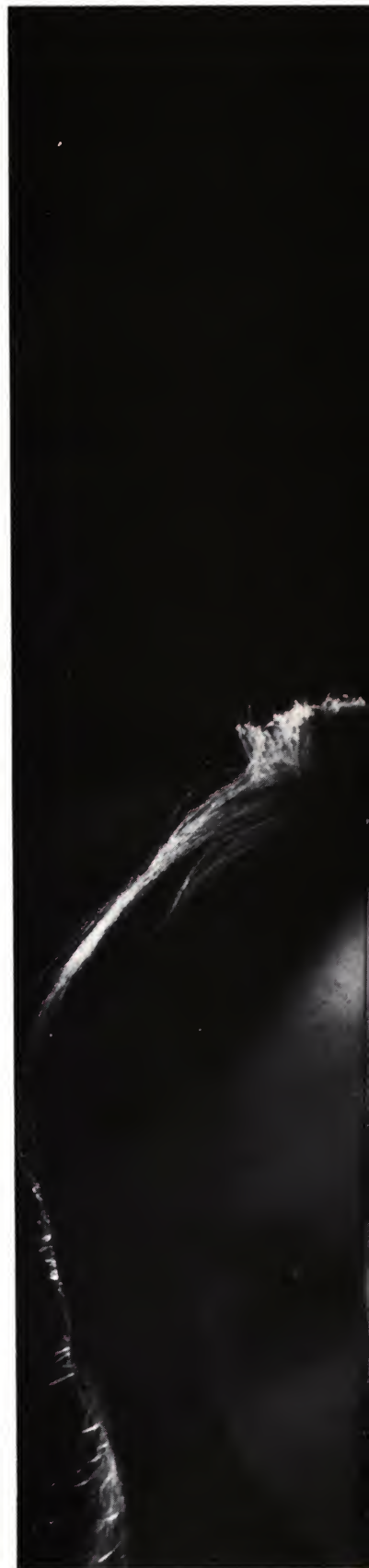
---

### **System Requirements**

**64K RAM (32 or 16K with modifications)**

**Extended Color Basic**

**Editor/Assembler optional**









program and select option 2, read entire buffer. Position the tape at the beginning of your voice and press enter. Turn up the volume on the cassette player to produce more distinct sound. The cassette motor comes on, and you'll hear your voice through the TV speaker.

Pressing any key other than break begins digitizing the recorded sound. The cassette motor turns off when the digitization buffer is full. If you press the break key at this point, you'll return to the program without digitizing anything.

Now, select option 1, play entire buffer, to hear what is now in the digitization buffer. The sound might be scratchy, but you should be able to understand it.

The 16-second digitization buffer allows you enough time to record several sentences. Of course, you won't always want to use the entire buffer. Option 3, play section, plays only part of the buffer. Option 4, read section, uses only part of the buffer to store sound.

The beginning of the program sets up and spaces the buffer sections; there are 16 of them, labeled with numbers from 0 to 9 and letters from A to F. Option 5, redefine section, lets you change the boundaries of these sections, the beginning and end of which are given in hexadecimal numbers. The usual procedure is to listen to the sections, change their positions using option 5, and then listen to them again and repeat the process until each section holds the sound you want.

For example, you can use option 2 to read an entire sentence into the buffer and then change the sections so that each section contains a single word. You can then access each word separately and use them to form new sentences.

Option 6 changes the speech at which the sound is played back (for options 1 and 3). The number 17 is the fastest speed, equal to normal speech. Smaller numbers will play the sounds more slowly.

Option 7, view, gives you a PMODE 4 graphics representation of the sound-buffer portion of memory. See Fig. 1 for an example. The up- and down-arrow keys scroll the screen, and pressing R returns you to the program.

Option 8 ends the program.

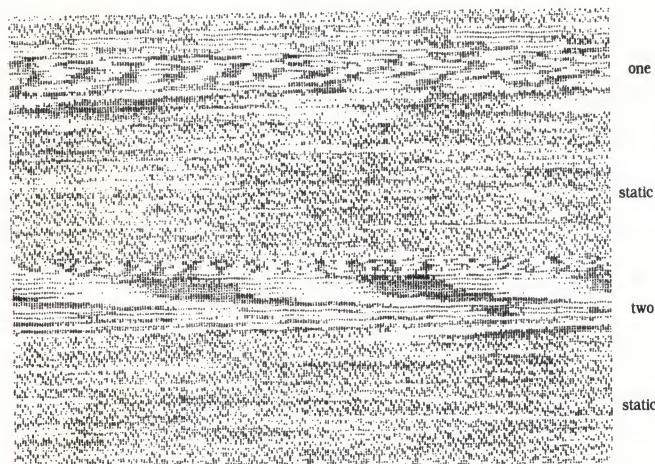


Fig. 1. Graphic Representation of the Words "One" and "Two" in the Sound Buffer

## How it Works

I've added comments to Listing 1, which should give you most of the details as to what's going on in the program, but you still might not understand the general method of operation.

The recorded cassette provides the sound for the program, which reads bit 0 of memory location \$FF20 many thousand times a second. This input is only a zero or one, which determines whether the sound on the tape is above or below a certain level. Limiting the sound level to zero or one loses much of the subtlety of tone, especially if you use the program to digitize music. Only the basic waveform remains, which explains why the sound quality is somewhat poor. (See Figs. 2 and 3.)

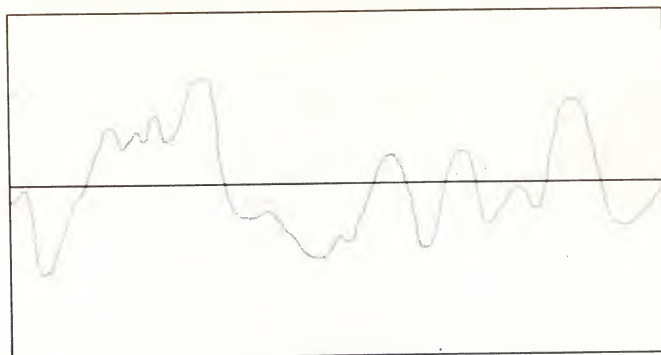


Fig. 2. Sound Waves as You Hear Them (Before Digitization)

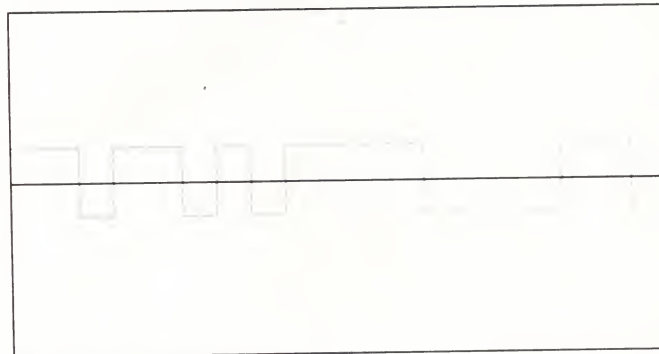


Fig. 3. Digitized Sound Waves

After the program reads eight of these sound bits, it puts them into a byte in the buffer and reads more bits. When the buffer is full, Listing 2 POKEs the start and end buffer locations into the machine-language program. On a 64K machine, the entire buffer starts at \$4000 and ends at \$FF00 (almost 48K of memory). This gives you some idea of the detail necessary to accurately reproduce sound.

To play back the digitized sound, the computer takes one bit at a time from the buffer and sends a corresponding high or low tone to the speaker. Doing this thousands of times per second produces the original sound. Once again, the Basic program POKEs in start and end boundaries.

It is sometimes interesting to alter the speed of the sound. If I had used a delay loop, adding the delay thousands of times a second would slow the speed too much. Instead, I used NOP instructions (no operation) to add a few cycles to change the speed. For normal speed, the program bypasses all the NOPs, but for slower speeds, the loop changes to include a few NOPs.

Digitize (Listing 2) relies on the machine-language program to work. The Basic program is much easier to work with as you experiment. Two 16-position arrays (S and E) hold the start and end locations of the buffer sections. The program has many prompts and rejects illegal values. Remember that you must enter the section start and end values in hexadecimal.

## Modifications for 16K/32K

The machine-language program is completely position independent. Therefore, you can place it at any location below \$8000 as long as it is protected from Basic and the digitization buffer does not overwrite it. You can place this buffer at any convenient area not used by Basic. As I have it, the machine-language program uses \$3F00 to \$4000, and the buffer uses \$4000 to \$FF00. With a 48K buffer, this leaves about 8K for Basic with four graphics pages.

If you have 32K, I suggest you leave the machine-language program where it is and change the buffer end to \$8000 by changing the value &HFF in lines 190 and 210 (Listing 2) to &H80. To set up the sections properly, also change line 130 to the following:



FORQ = 0TO15:S(Q) = &H40 + Q\*4:E(Q) = &H40 + Q\*4 + 4:NEXT

This gives you a 16K buffer and plenty of space to work with in Basic.

If you have a 16K machine, you have to give up all eight of your graphics pages for buffer space. Add a PCLEAR8 to line 10. Change S = &H40:E = &HFF in lines 190 and 210 to S = &H6:E = &H36. Change line 130 to:

130 FORQ = 0TO15:S(Q) = &H6 + Q\*3:E(Q) = &H6 + Q\*3 + 3:NEXT

Change the value of the variable OF at the end of line 380 to 6.

These changes give you a 12K buffer, but not much space for any other program. You might want to change the location of the buffer for other reasons. Follow the modifications given above, but use your own values.

If you want to double the speed of the sound, make the following change in line 60:

60 IF S >= E THEN STOP ELSE POKEML + &H74,S:POKEML + &HA5,E:POKE65495,0:EXEC PL:POKE65494,0:RETURN

The POKE 65495,0 doubles the microprocessor's internal clock speed, and the POKE 65494,0 returns it to normal. The higher speed scrambles the video display while the sound is being played; therefore, the increased speed might not work on all CoCos.

The sound produced this way is squeaky at speed 17, but it is about normal at speed 0. Sometimes words sound better at higher speeds.

### Using These Routines Yourself

You can use this system as is to experiment with voice synthesis, or you could add my programs to your own—a game, for example.

You can save the digitization buffer as a machine-language (CSAVEM) file, but that only works for the part that is below \$8000. However, even if you could save it all, you would need about six minutes of tape to save a 48K buffer. It's much more efficient to record the sound on the cassette along with the program. This involves saving the following four things on tape, in this order:

- A loader program in Basic (see Program Listing 4). This loads all the other parts.
  - The machine-language program (Listing 1, assembled).
  - The sound you wish to digitize.
  - The program that uses the digitized sounds. As you update your program, save it in the same spot as it was on the tape.
- You don't need to go through this process unless you want a permanent program that uses the digitization routines and a specific set of words.

When you want to use a digitized sound in your program, call a subroutine (such as line 60 in Listing 2). The values of S and E in line 60 indicate the start and end locations of the part of the buffer you want to hear. Define the variables in your program as line 20 does in Listing 2, so the values are POKEd into the correct location. You might want to use two arrays (S and E), as does Listing 2, if you are using a number of words.

### The Last Word

The sound digitization program here opens up a whole new area for you to explore with your CoCo. There are more efficient ways to code the digitized sound, but they are quite complex and take a long time to develop. I'll leave that task to someone else. ■

See program listing on page 47.

Address correspondence to Jeff Rubidge, Box 855, Battleford, Saskatchewan, S0M 0E0, Canada.

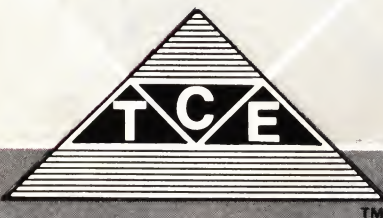


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# *Using Basic Variables*

*You can use a program more efficiently  
if you have a good understanding of its variables.*

**W**hen you are dealing with large Basic programs, the proper use and documentation of variables can be a major job. These three programs will help you to use Basic variables in the most efficient way possible.

Program Listing 1, Variable Lister, lists all the variables that the Basic interpreter encounters to screen or printer. It divides numeric variables, string variables, and arrays into separate categories and lists numeric and string arrays together. Program Listing 2, Number Dump, prints the values of all numeric variables the Basic interpreter encounters. Program Listing 3, String Dump, prints the value of all string variables. Listings 2 and 3 require a printer, which is optional with Listing 1.



**System Requirements**  
**32K RAM**  
**Extended Color Basic Printer**





Demarest





## Using the Programs

Be sure to save copies of programs to cassette or disk before executing them. All three programs are written in position-independent code so they can be moved to and executed from any valid RAM. You must run the Basic program you want analyzed before using these utilities.

When you execute Variable Lister, you'll see the N, S, A, or R prompt. Pressing N lists numeric variables, S lists string variables, A lists arrays, and R returns to Basic. String and numeric variables list separately to make examining them more convenient. Array variables have string and numeric listed together, since relatively few arrays are generally used in a program. If more variables in the program are being examined than will fit on one text screen, the variables are displayed in page format, and you use the space bar to flip from page to page. After all variables are listed, press the space bar to return to the menu.

Number Dump and string Dump complement each other. You must have a printer on line to use these two utilities. After running the Basic program, execute String Dump or Number Dump. All the string or numeric variables thus far encountered by the Basic interpreter will print with their current value. By calling these utilities from different places in a Basic program, you can observe how the variable values change. Notice that the order in which the variables print is always the same.

Program Listing 4 illustrates the use of all three utilities in a Basic program. If you load Variable Lister into memory at &H7D00, as it appears in the program listing, the execu-

tion at line 25 will show X for numeric, no string variables, and A\$ BG for arrays. On the execution in line 70, numeric will show X JJ Y1, string will show Z\$, and arrays will show A\$ BG B.

If you load Number Dump at &H7D00, the execution in line 25 will print X = 3.1416. The execution in line 70 will print the values of the same numeric variables that Variable Lister listed in line 70. If you load String Dump at &H7D00, it will print the value of string variables in the same order that Variable Lister listed them.

## Background

Basic maintains two variable storage areas. The first area is for simple variables, and the second is for arrays. The 2-byte value at \$1B and \$1C points to the start of simple variable storage. The 2-byte value at \$1D and \$1E points to the end of simple variable storage and the beginning of array storage. The value at \$1F and \$20 points to the end of array storage. Each time Basic encounters a variable during program execution, it searches through the appropriate storage area in a sequential manner. If the variable is not encountered, space is allocated for it at the end of the variable storage area. Thus, the later in a program a variable is encountered, the longer Basic will take to find it.

Simple variables each take 7 bytes of memory. Table 1 summarizes what each byte means. Byte 2 is the value to which Basic points when you use the VARPTR command to point to a variable. You can find more detail in the back of the Extended Color Basic

manual in the machine-language section.

Arrays are stored in a somewhat different manner. A descriptive account of array storage is in "Journey to the Center of ROM, Part II" (*HOT CoCo*, November 1983, p. 110), by Mark Goodwin. For the purposes of these programs, this information will suffice:

Bytes 0 and 1—same as simple variables  
Bytes 2 and 3—offset to start of next array

The actual variable values are stored in 5-byte blocks in the same manner as simple variables.

Variable Lister searches through both variable storage areas and examines the name of each variable. This is not complicated for simple variables, as each variable occupies exactly 7 bytes. For arrays, the examination of each variable involves a little more effort, but the process is still simple. By adding the offset value in bytes 2 and 3 to the starting address of the current array, you can find the start of the next array. If this value is greater than the 2-byte value at \$1F and \$20, then you have reached the end of arrays. Therefore, most of the work that Variable Lister does involves finding and processing variable names.

Number Dump and String Dump do more than Variable Lister does. They search for the name of each variable as Variable Lister does, but they also print the value of each variable. This involves digital-to-analog conversion, floating-point conversions, mass string processing, and so on. Obviously, printing the value of variables requires more work. A powerful ROM routine does the job.

Basic programs commonly call machine-





language subroutines, but it is also possible to call Basic subroutines from machine language. This method is used to print the values of variables in Number Dump and String Dump. The programs are well documented, and seeing how the ROM routine located at \$ADC6 works is simple. The 2-byte value at \$A6 and \$A7 point to the next Basic value to be interpreted while Basic is running. By putting an address in this location pointing to a tokenized Basic line in the calling program and setting the proper entry conditions, Basic executes the tokenized line.

The tokenized line must end in a zero to indicate end of line to Basic, and the original value in \$A6 and \$A7 must be restored to allow execution of Basic to continue. By changing the value of the variable in a simple PRINT statement, all simple variables can be printed. String Dump sends values from string storage to the printer. Thus, you need a routine to check each string to make sure that it contains only valid ASCII characters.

I discovered this while debugging String Dump. I left while String Dump was working. When I returned, I found that my printer interpreted 128 as a form-feed command. I also discovered something else. Do you have any idea what the paper from 96 form feeds looks like on your desk, floor, and chair? Thus, any string that contains other than valid ASCII characters won't be printed. These programs don't work on arrays. It is difficult to write a generalized routine to print all the values of any array, but a one- or two-dimensional array dump is not difficult. You can create a tokenized Basic line such as the following:

```
PRINT#-2,AA(0001), (for 1 dimension)
PRINT#-2,AA(001,001), (for 2 dimensions)
```

Not only does the variable name need to be changed at the appropriate times, but the value of the subscripts also needs to be changed. You can accomplish this with nested loops. Also, you must take full advantage of the fact that Basic ignores leading zeros and spaces. If you do this, it is easy to build the Basic line to the maximum size needed yet still easily handle smaller lines (i.e., PRINT AA(1111) as compared to PRINT A(1)). A(1) is the same as A(0001) to Basic. This ROM routine is powerful, and you can use it for many purposes.

BYTE 0	The first letter of the variable name in ASCII.
BYTE 1	For a numeric variable, the second letter in variable name. If variable name contains only one letter, byte 1 = 0. For string variables, byte 1 always has \$80 added to it.
BYTE 2	For numeric variable, is the exponent. For string variable, is length of string.
BYTE 3	For numeric variable, is most significant byte of mantissa. Unused for string variables.
BYTE 4	For numeric, is next least significant byte. For string is byte 1 of 2-byte pointer to storage area for the text the string contains.
BYTE 5	For numeric, is next least significant byte. For string is byte 2 of pointer to storage area.

Table 1. Summary of Meaning of Bytes



## Summing Up

The place a variable occupies in its storage area greatly influences program speed. Consider Program Listing 5. Run this program, and note the value returned by the timer. Now add the following line of code:

```
9 X=0: Y=0: Z=0: X1=0
```

Rerun the program, and note the value returned by the timer. If there are a greater number of variables, this time differential is quite significant. By first defining variables used in graphics routines, number crunching, and so on, you can often note a significant increase in execution speed.

It's possible to make Number Dump and String Dump work on one- and two-dimensional arrays. If you need this capability but don't have the time to write the needed code, I'll furnish you with commented source code (in an ASCII file) and object code for programs that will dump one- and two-dimensional string and numeric arrays as String Dump and Number Dump do with simple variables. Send your name and address along with \$7.95 to me, and I'll promptly send you a copy of the program on cassette. ■

See program listing on page 49.

Address correspondence to Bob Gaebler, 1611 Fair Oaks, Austin, TX 78745.



# Dawn at the Crossing Gate

**Direct and produce your own animated features, complete with sound track.**

**H**ave you ever wanted to make a movie? Have you ever thought of making objects move onto the screen from beyond the screen edge? Have you tried moving objects around on the screen as if they were sprites? Have you ever PSET points with increasing brightness from black to white as in a black-and-white photograph? Have you ever dreamed of sound capability equal to that of your stereo system? I knew I'd get your attention.

All these are part of Dawn at the Crossing Gate. Some techniques rely on psychological approximations of the real thing, but you can run them all on a stock Color Computer with Extended Color Basic and 32K of memory.

The movie starts with a moon in a night sky. The moon sets as the sky brightens with false dawn. The sun rises above the horizon in a true dawn sky. As the sun clears the horizon, the sky turns blue and white clouds begin to form. When the sun reaches the zenith, the crossing gate lowers and a train enters from off screen and puffs into the station.

A sound track supplies additional interest. Since the program runs full speed on the graphics, any sound generation will slow it down. But, after all, if you're using a tape recorder to store the program, why not use it to store the sound track? I did promise high-fidelity sound. I used recordings of crickets, a selection from Grieg's *Peer Gynt* (*Morning Mood*), the sound of a steam locomotive, and bird songs.

## Follow the Listings

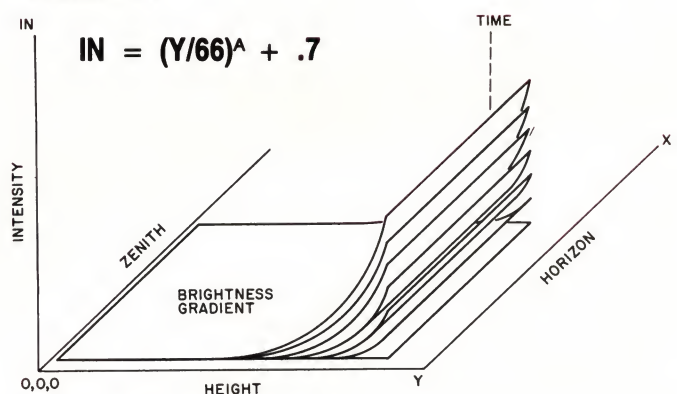
The Basic and machine-language programs, Listings 1 and 2, should be easy to follow. A highlight of the program is the simulation of a slowly brightening dawn sky, because you can't program pixels to change their brightness. In the PMODEs, pixels are either on, with one of eight colors, or off. You can, however, use the density gradient method of printing to obtain brightness. Look at any black-and-white magazine or newspaper for an example.

Figure 1 is a three-dimensional graph of my assumed brightness gradients for a dawn sky. The equation represents the curve of the cross section of the gradients in Fig. 1. To implement this on the screen, you turn on a line of randomly placed pixels, equal in number to that indicated by the equation.

In PMODE3, the command is as follows:

```
line x FOR Y=0 TO 121: FOR IN = 1 TO INT((Y/66) ^ A
+ .7):PSET(RND(255),Y,4):NEXT IN,Y:A = A + 1:IF A < 8 THEN line x
```

**FIGURE 1**



**Fig. 1. Brightness Gradients**

where Y is the screen line number and IN is the light intensity. The above line gives eight overlapping layers of random pixels clustered at the bottom of the screen.

As you might expect, this loop is too slow to be useful in a real-time graphics program. You need the Assembly-language program in Listing 2 as a replacement. Since I didn't want to attempt complex math in Assembly language, a Basic driver program POKes the values of the brightness equation into a lookup table. Listing 2 samples the table as needed.

The maximum resolution of a CoCo is 256 by 192 pixels, not fine enough for a perfect illusion of increasing brightness. You need additional help to achieve photo quality. For this program, I added objects to the screen to enhance the illusion. The sky contains a moon that descends toward a black horizon as the sky brightens. A building and a railroad crossing gate are on the horizon. The silhouettes of these two objects become more visible as the sky brightens. Initially, the brightness pixels seem to be white stars. However, after the silhouettes appear and the moon fades into the brightening sky, the illusion of increasing brightness is almost total.

## Sprites

The term sprite describes a graphic character that can move around a graphics screen without colliding with other objects. The





## System Requirements

### 32K RAM

### Extended Color Basic



sprite appears to go over or under any other objects present. Usually, sprites are under hardware control with about 10 vertical layers of transparent overlay. In Dawn, you control the sprites the hard way, with software.

CoCo has two powerful commands in Extended Color Basic: GET and PUT. The proper use of these commands gives results almost identical to sprite hardware. Your manual describes the use of GET and PUT and the options, PSET, PRESET, AND, OR, and NOT. The manual tells you not to use the last three options in the color modes. Not so! Dawn makes extensive use of the options in both the color and noncolor modes, PMODE3 and PMODE4. However, this technique is tricky because CoCo Basic uses a different method of coding graphics memory for PMODE3 than for PMODE4.

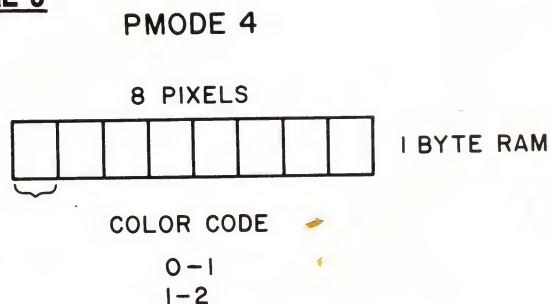
Before explaining the technique, I must explain the origin of the false colors used throughout the program. These occur in PMODE4 and in mixed modes like PMODE4:SCREEN1,1:PMODE3 that you use for most of Dawn. The source of the false colors and the proper use of the PUT options, AND, OR, and NOT depend on two chips used in the CoCo: the synchronous address multiplexer (SAM) and the video display generator (VDG).

When Basic receives the command PMODE3:SCREEN1,1, it sets the graphics hardware to format the screen as shown in Fig. 2. Figure 3 shows the format of command PMODE4:SCREEN1,1. When you send mixed commands (such as PMODE4:SCREEN1,1:PMODE3), the VDG expects the format of PMODE4 but instead gets the format

of PMODE3. Simply stated, Basic automatically SETs, DRAWs, PAINTs, or makes LINES using every other horizontal pixel (screen point) when you use the colors 2 or 3.

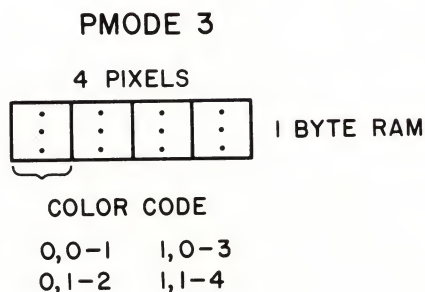
One more fact—in PMODE4, the VDG turns off the color burst in the TV signal. The signals are still in color but not properly synchronized. Further, the VDG randomly turns on the rising or falling edge of CoCo's 3.58MHz clock, which equals the color-burst frequency. The result is that every other vertical column is red or blue 50 percent of the time, because alternate columns are all in phase, relative to the 3.58MHz clock. If adjacent horizontal pixels light, the result is white, because adjacent pixels contain out-of-phase 3.58MHz signals and cancel each other out for color.

**FIGURE 3**



*Fig. 3. Screen Format of PMODE4:SCREEN1,1*

**FIGURE 2**



*Fig. 2. Screen Format of PMODE3:SCREEN1,1*

If you cannot predict the colors red and blue when you turn on your CoCo, why is the sun always red and the sky always blue in Dawn? The colors 2 and 3 are made variables (C1 and C2), which you set when you see the color-test patch at the start of the program.

So, back to GET and PUT. When you use the options AND, OR and NOT, you're using Boolean algebra. In the noncolor modes, the results are simply an addition to or replacement of the screen image. In color modes, the effect is unexpected. For example, red ORed; with blue = white; red AND blue = black; white OR any = white; white AND color = same color; and white AND white = white.

Consider lines 21, 22, 25, and 27 of Listing 1. To raise the red sun in a blue sky through white clouds, the program makes the sky black



Table 1. Variables List

B1\$ road  
 B2\$ centerline  
 B3\$ gate and light, no color code  
 B4\$ roof outline  
 B5\$ gate light, no color code  
 B6\$ station walls and floor  
 B7\$ one plant  
 B8\$ all plants  
 B9\$ 3 clouds  
 C1\$ gate and light, with color code  
 C2\$ gate light, with color code  
 L1\$ gate direction  
 R\$(0-2) cloud locations  
 A, A3, AA, B, C general purpose  
 BS bright sky at horizon  
 C1, C2 color codes for blue and red  
 E engine  
 H, H1 sun movement coordinates  
 HR, HS station roof and walls  
 M moon  
 MS moon sky  
 PF, PS, PT first second and third part of smoke puff  
 SB black sun  
 SR red sun  
 SS sun sky

in the cloud section, puts this sky with any previously made clouds with OR, draws the new clouds, saves the sky, erases the sky with blue, ANDs a black sun in a white sky, ORs a red sun in a black sky, and ORs the clouds in a black sky. As you can see in Listing 1, it makes a separate save of the sky in line 25 before adding the sun. Other parts of the program need this step to restore the sky. If logic is your forte, you might find a simpler method of moving the sun. I certainly tried. The result of my method is a sun sprite that does not collide with sky or cloud.

Radio Shack states in the Extended Color Basic manual that you need two-dimensional arrays to save GET arrays. This isn't true. A DIM(X\*Y/N) where X and Y are the rectangle dimensions and N = 40 in PMODE3 and 4, 80 in PMODE1 and 2, and 160 in PMODE0 works, too. The manual also says that the coordinates of the GET-PUT rectangle must not exceed the screen size of  $0 < x < 255$  by  $0 < y < 191$ . This is correct. So how does the engine move into view on the right edge of the screen? Figure 4 has the answer. The PUT rectangle stays at the right edge of the screen while the GET rectangle starts to the left of the engine and gradually moves right until it covers the whole engine.

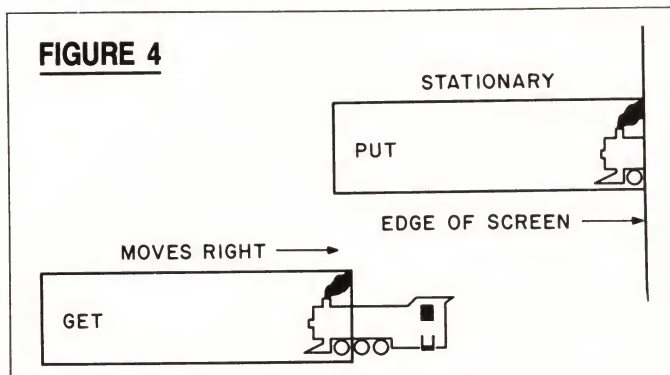


Fig. 4. Engine Moves into View

## The Sound Track

Despite articles on four-part harmony, the Color Computer cannot compete with a tape recorder. Basic has the commands MOTOR (ON or OFF) and AUDIO (ON or OFF). Imbed these in your program and any sound you record will play through your TV speaker. You can synchronize your sound track by CSAVEing a dummy program (containing only a name) and SKIPFing past it. Record your sound track at this point, and your recorder will always start at the same spot on the tape when you play it back.

Dawn also uses the TIMER command and FOR...NEXT loops to stop the graphics until the right passage on the sound track is ready. I synchronized the sun and train with the sound by this method. You can remove lines 37-39 and any TIMER statements or timing loops (lines 22, 61, 67, 73, 75, and part of 17) from the program. They are here because my demo program has a sound track, and they will only be useful if a sound sheet or tape of the program with music is available.

## Final Points

Listing 1 contains a driver for the machine-language routine of Listing 2. After you have typed and saved your first copy of Listing 1, do not run it! Enter RUN 100 and follow the directions exactly. The speedup POKE is used in lines 1, 39, and 102. If your CoCo can't take it, remove the POKE 65495,0. Table 1 is a variables list for those who want further insight to the program. ■

See program listing on page 45.

Robert Gault holds a Ph.D. in chemistry and is a forensic toxicologist. Address correspondence to him at 832 N. Renaud, Grosse Pointe Woods, MI 48236.

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# HOT CoCo's Pull-Out Program Listings



All program listings are available on our Instant CoCo cassette.

## Dawn at the Crossing Gate

### Program Listing 1.

#### Dawn at the Crossing Gate

```
1 CLS:POKE65495,0:X=RND(-TIMER):
GOTO77
2 'ENTRANCE OF ENGINE FROM OFF S
CREEN
3 PUT(20,150)-(170,189),E,PSET
4 FORA=0TO64STEP2:FORAA=1TO4*B:N
EXTAA=B+B+1:GET(26+A,159)-(102+A
,190),E,G:PUT(179,91)-(255,121),
E,PSET:DRAWCL:PAINT(212,117),C1
,1:C=RND(5)
5 IFA>=12THENPUT(256-A,78)-(266-
A,88),PF,AND:PCOPY6TO2:PCOPY7TO3
6 PMODE3,1:PAINT(264-A,85),C2,C2:
PMODE3,5:PAINT(264-A,85),C2,C2:P
UT(256-A,64+C)-(266-A,74+C),PS,A
ND:PCOPY6TO2:NEXTA ELSEPCOPY6TO2
:PCOPY7TO3:NEXTA
6 'RUN ENGINE INTO STATION WITH
BRAKING
7 B=0:FORA=2TO88STEP2:C=RND(5):P
UT(179-A,91)-(255-A,121),E,PSET:
DRAW CL:PAINT(212,117),C1,1:PUT
(90,81)-(170,121),HS,AND:PUT(90,
81)-(170,121),HR,OR
8 IFINT(A/4)=A/4THENPUT(192-A,78
)-(202-A,88),PF,AND:PCOPY6TO2:PC
OPY7TO3:PMODE3,1:PAINT(200-A,85)
,C2,C2:PMODE3,5:PAINT(200-A,85),
C2,C2:PUT(192-A,64+C)-(202-A,74+
C),PS,AND:PCOPY6TO2:FORAA=1TO10*B
^4:NEXTAA:B=B+.06:NEXTA:GOTO11
9 PCOPY6TO2:PCOPY7TO3:FORAA=1TO
10*B^4:NEXTAA:B=B+.07:NEXTA
10 'ERASE SMOKE WITH GUST OF WIN
D
11 FORA=255TO110STEP-8:CIRCLE(A,
70),10,C2,1,.3,.7:PAINT(A+3,67),
4,C2:PAINT(A+3,73),4,C2:IFA>=235
THENPCOPY6TO2:NEXT ELSE PAINT(A+
20,67),C2,C2:PAINT(A+20,73),C2,C
2:PCOPY6TO2:NEXT:COLORC2,1:LINE(
105,60)-(255,88),PSET,BF:PCOPY6T
O2
12 'RAISE GATE
13 FORA=1TO300:NEXT:DRAW"C"+STRS
(C2)+":XB3$":L1$="A1":DRAW C2$:
PCOPY6TO2:PCOPY7TO3
14 'SLOW PUFFING
15 POKE65494,0
16 FORA=1TO650:NEXT:PUT(104,78)-
(114,88),PF,AND:PCOPY6TO2:PMODE3
,1:PAINT(110,86),C2,C2:PMODE3,5:
FORA=1TO100:NEXT:PAINT(110,86),C
2,C2:PUT(104,65)-(114,75),PS,AND
:PCOPY6TO2:FORA=1TO450:NEXT:PUT(
104,65)-(114,75),PT,OR:PCOPY6TO2
:FORA=1TO200:NEXT
17 PAINT(106,70),C2,C2:PCOPY6TO2
:IFTIMER<26160THEN18ELSEAUDIOOFF
:MOTOROFF
18 FORA=1TO200:NEXT:GOTO16
19 H1=2:FORH=5TO80STEP5:PUT(0,80
```

```
-H)-(255,120-H),BS,OR:GOSUB25:LI
NE(24,121)-(76,161),PRESET,BF:DR
AW C2$:PUT(90,81)-(170,121),HS,A
ND:GOSUB29:GOSUB27:H1=H1+2:NEXTH
:RETURN
20 'MAKE CLOUDS RAISE SUN IN BLU
E SKY
21 FORH1=H TOH1+74STEP2:LINE(25,
0)-(75,45),PRESET,BF:PUT(24,0)-
(76,45),SC,OR:DRAWB9$:GET(24,0)-
(76,45),SC,G:COLORC2,1:LINE(25,0)
-(75,45),PSET,BF:GOSUB25:PUT(24,
0)-(76,45),SC,OR:GOSUB29:GOSUB27
:FORA=0TO2:RS(A)="BM"+STR$(RND(2
40)+10)+", "+STR$(RND(40))
22 NEXTA:FORT=1TO700:NEXTT:NEXTH
1:RETURN
23 'SUBROUTINES WITHOUT LOOPS
24 'SAVE SKY AND PUT SUN
25 GET(25,110-H1)-(75,160-H1),SS
,G:PUT(25,110-H1)-(75,160-H1),SB
,AND:PUT(25,110-H1)-(75,160-H1),
SR,OR:RETURN
26 'ERASE SUN WITH SKY
27 PUT(25,110-H1)-(75,160-H1),SS
,PSET:RETURN
28 'MOVE HIGH PAGES TO LOW PAGES
29 PCOPY7TO3:PCOPY6TO2:PCOPY5TO1
:PCOPY8TO4:RETURN
30 DIM BS(262),E(150),HR(85),HS(
85),M(66),MS(66),PF(3),PS(3),PT(
3),RS(2),SB(66),SC(133),SR(66),S
S(66):M=256*PEEK(27)+PEEK(28):PO
KEM-&H3D5,INT((M-&H3D4)/256):POK
EM-&H3D4,M-&H3D4-256*INT((M-&H3D
4)/256):LOAD TABLE WITH LOC. OF
FIRST VALUE-1
31 L1$="A1":B1$="C0;BM200,122;R2
0,M240,191;L60;M200,122":B2$="C4
;BM210,122;D69":B3$="BM225,121;U
6R2D6L2;BM+0,-4;XL1$;L26;BM+9,0;
U2R6D1L6D2R6D1L6D1R6;A0":B4$="BM
90,99;M+100,-10;R61;M+100,+10;L80"
:B6$="BM100,119;NU2R6D1L6D1L60
D1R60"
32 B5$="BM210,117;C4;U1R2D3L2U1
":B7$="C0;U10L1U2L1U1L1;BM+3,+11
;L1U2L1U2L1U1L1;BM+4,+0;R1U1R1U1
E3":B8$="BM200,135;XB7$;BM150,180
;XB7$;BM30,178;XB7$;BM60,160;XB7
$;BM140,140;XB7$;BM110,170;XB7$;
"
33 B9$="C4;XR$(0);S6;NR4D1NL2NR6
D1NR2L8D1NL1NR6FLR2BR6GL12;XR$(1
);NR2BG1NR4BG1NL1NR5G1NL1NR3D1NL
2R6D1NL2NR2D1NL1R1;XR$(2);NR4D1N
L3NR7D1NR3L2BL2L3D1NL1R8G1NL4G1L
2BM-5,-1;L2S4":C1$="C1;XB3$;XB5$
":C2$="C1;XB3$;
34 CLS5:PRINT0224,"HIT <ENTER> I
F RED":PRINT0256,"HIT <SPACEBAR
> IF BLUE":SCREEN0,1:FORT=1TO300
0:NEXTT:PMODE3,1:PCLS4:LINE(80,8
5)-(100,105),PRESET,B:PAINT(90,9
0),3,1:PMODE4,1
35 SCREEN1,1:FORT=1TO3000:NEXTT:S
CREEN0,1:FORT=1TO3000:NEXTT:AS=IN
KEYS:IFA$=" "THEN35
36 IFA$=CHR$(32)THENC1=2:C2=3:CP
```

Dawn at the Crossing Gate .....	45
Match and Learn .....	46
Digitize Me .....	47
Closed for Inventory .....	48
Using Basic Variables ....	49
Five Card CoCo .....	50
Mindbusters .....	52

```
=105ELSEIFA$=CHR$(13)THENC1=3:C2
=2:CP=54ELSE35
37 POKE65494,0:CLS:PRINT"SET SOU
ND TO COMFORTABLE LEVEL. MAKE SU
RE CASSETTE IS IN PLAY MODE AN
D AT THE START OF SIDE #2":PRINT
:PRINT"HIT ANY KEY TAPE WILL SY
NC UP."
38 PLAY"1100;C;P5":IFINKEY$=" "TH
EN38ELSESKIPF
39 POKE65495,0:TIMER=0:MOTORON:A
UDIOON
40 CLS0:PRINT@449,"as";CHR$(128)
;"the";CHR$(128);"night";CHR$(12
8);"precedes";CHR$(128);"the";CH
R$(128);"dawn";POKE65495,45
41 'CREATE STARS
42 PMODE4,1:PCLS:FORA=1TO100:PSE
T(RND(255),RND(120)):NEXT:GET(15
0+SM,10+SM)-(190+SM,50+SM),MS,G
43 'CREATE MOON
44 PMODE4,5:PCLS:CIRCLE(126,96),
6,1,1,.2,.8:CIRCLE(130,96),6,1,1
,.3,.7:PAINT(123,96),1,1:GET(106
,76)-(146,116),M,G
45 'GIVE THE AUDIENCE A VIEW
46 PMODE4,1:PUT(150+SM,10+SM)-(1
90+SM,50+SM),M,OR:SCREEN1,1:CLS
47 'CREATE STATION
48 PMODE4,5:PCLS1:DRAW"C0;XB4$":
LINE(80,70)-(180,130),PRESET,B:
PAINT(90,75),0,0:GET(90,81)-(170
,121),HR,G:PCLS1:DRAW"C0;XB4$":
PMODE3,5:DRAW"C1;XB6$":PMODE4,5
:PAINT(130,90),0,0:GET(90,81)-(1
70,121),HS,G
49 'CREATE ENGINE
50 PMODE3,5:COLORC2,1:LINE(20,15
0)-(170,189),PSET,BF:DRAW"BM100,
182;C1U8BM+6,-6;R4U4R2D4R28E4R12
NR4D2L16U4BM100,174;L2U3R4C4G1C
1BM100,186;L8M+8,-4;BM100,173;M+
6,-5;BM100,180;R28BM106,186;NL6U
4M+3,-3;BM138,179;M+3,+3;BM147,1
84;D4R4U4
51 IFC2=2THENA=-1ELSEAA=0'PREVEN
T WHEEL BLEED OUT
52 FORA=0TO20STEP10:PMODE4,5:CIR
CLE(112+A+AA,185),3,0:PMODE3,5:P
AINT(112+A+AA,185),4,1:NEXTA:LIN
E(144,170)-(149,175),PRESET,BF:P
AINT(110,175),4,1:PMODE4,5:CIRCL
E(120,174),8,0,.5:POKE178,CP:PAI
NT(120,174),0,0:GET(20,150)-(170,
189),E,G
53 'CREATE SUN
54 PMODE3,5:PCLS4:CIRCLE(126,96),
18,1:PAINT(126,96),1,1:GET(101,
71)-(151,121),SB,G:PCLS:CIRCLE(1
26,96),18,1:PAINT(126,96),C1,C1
:GET(101,71)-(151,121),SR,G
55 'CREATE SMOKE PUFFS
56 CIRCLE(100,100),4,4:PAINT(100,
100),4,4:GET(95,95)-(105,105),P
T,G:PCLS4:DRAW"C1BM100,103;NU1N
1R1NU1ND1R1NU1DL":C4:GET(95,95)-
(105,105),PF,G:CIRCLE(120,120),4
,1:PAINT(126,120),1,1:GET(115,11
Listing continued
```



# Listing continued

```

5) -(125,125),PS,G
57 PCOPY1TO5:PCOPY2TO6:PCOPY3TO7
:PCOPY4TO8:RETURN
58 'MAIN PROGRAM
59 'DIMENSION ARRAYS, CREATE OBJ
ECTS FOR GET ARRAYS, DETERMINE R
ED AND BLUE COLOR CODE, SET SOUN
D LEVEL, TURN ON FIRST GRAPHIC -
STAR FIELD-LOAD ML TABLE WITH C
ORRECT INITIAL VALUE
60 GOSUB30
61 IFTIMER<1380THEN61
62 'BRIGHTEN SKY AND MOVE MOON
63 PUT(150+SM,10+SM)-(190+SM,50+
SM),MS,PSET:EXEC M-&H44B:SM=SM+8
:GET(150+SM,10+SM)-(190+SM,50+SM
),MS,G:A3=A3+1:FORA=1TO300STEP
A3+1:NEXTA:IFA3=8THENGET(0,80)-
(255,120),BS,G:GOTO65
64 PUT(150+SM,10+SM)-(190+SM,50+
SM),M,OR:DRAW C2$:PUT(90,81)-(17
0,121),HS,AND:GOSUB29:GOTO63
65 PUT(150+SM,10+SM)-(190+SM,50+
SM),M,OR:DRAW C2$:PUT(90,81)-(17
0,121),HS,AND:GOSUB29
66 'START SUNUP
67 IFTIMER<4300THEN67

```

```

68 GOSUB19
69 'MORNING
70 FORA=0TO2:R$(A)="BM"+STR$(RND
(240)+10)+", "+STR$(RND(40)):NEXT
A
71 PCLSC2:DRAW C2$:PUT(90,81)-(1
70,121),HS,AND:PUT(90,81)-(170,1
21),HR,OR:LINE(0,122)-(255,191),
PRESET,B:PAINT(2,124),4,1:DRAW"C
4BM2,122;R251":PMODE4,5:DRAW B8$
+B1$:PAINT(210,150),0,0:PMODE3,5
:DRAW B2$:H=H1:GOSUB21
72 'LOWER CROSSING GATE AND
START ENGINE
73 IF TIMER<1600THEN73
74 DRAW"C"+STR$(C2)+":XB3$":L1$
="A0":DRAW C1$:PAINT(212,117),C1
,1:PCOPY6TO2:PCOPY7TO3
75 IFTIMER<1870THEN75
76 GOTO3
77 PCLEAR8:GOTO60
100 CLS:X=PEEK(27)*256+PEEK(28)+
1099:PRINT"ENTER":PRINT" <POKE27
,";INT(X/256);":POKE28,";X-256*I
NT(X/256);">":PRINT"THEN <RUN 10
1">:END
101 PRINT:PRINT"TWO MINUTES WHIL
E I LOAD THE ML ROUTINE AND LOOK

```

```

UP TABLE FOR THEBRIGHTNESS GRADI
ENT."
102 POKE65495,0:X=PEEK(27)*256+P
EEK(28)-1099:FORA=0TO110:READ A
$:POKEX+A1,VAL("&H"+A$):A2=VAL("&
H"+A$)+A2:NEXT
103 IF A2<>10489THENCLS:PRINT"DA
TA ERROR IN LINES 102-105 A2=";A
2:END
104 DATA 96,BA,5F,ED,8D,00,68,86
,7A,A7,8D,00,68,AE,8D,00,65,30,0
1,AF,8D,00,5F,A6,84,A7,8D,00,54,
81,00,26,12,EC,8D,00,4A,C3,00,20
,ED,8D,00,43,6A,8D,00,45,26,DB,3
9
105 DATA 86,C0,A7,8D,00,3B,F6,01
,16,27,13,C4,03,27,09,44,44,5A,2
6,FB,A7,8D,00,29,F6,01,16,54,54,
54,4F,E3,8D,00,19,ED,8D,00,18,A6
,8D,00,16,AA,9D,00,10,A7,9D,00,0
C,BD,BF,1F,6A,8D,00,04,20,B0
106 FORA=0TO121:POKEX+6H78+A+C,I
NT((A/66)^B+.7):NEXTA:B=B+1:C=C+
122:IFB<8THEN106ELSEFORN=C TOC+2
:POKEX+6H78+N,0:NEXTN
107 CLS:PRINT"ENTER":PRINT"<DEL
100-107>":PRINT"THEN SAVE THE PRO
GRAM":POKE65494,0

```

## Program Listing 2. Dawn, Machine Language

0000	00100	ORG \$0000			00640	*RND/8 TO GET BYTE
	00110	*LOAD START OF GRAPHICS PG	004E 54		00650	LSRB
	00120	*AND SAVE IT IN line	004F 54		00660	LSRB
0000 96	00130	LDA SBA	0050 54		00670	LSRB
0002 5F	00140	CLRB	0051 4F		00680	SET CLRA
0003 ED	00150	STD LINE,PCR			00690	*ADD START OF SCREEN
	00160	*WE WILL BE DRAWING ON 122 LINES			00700	*SAVE FOR X,Y LOCATION
0007 86	00170	LDA #122	0052 E3	8D 0019	00710	ADD LINE,PCR
	00180	*KEEP A COUNT IN pass	0056 ED	8D 0018	00720	STD XPOS,PCR
0009 A7	00190	STA PASS,PCR	005A A6	8D 0016	00730	LDA MASK,PCR
	00200	*LOCATE OUR POSITION IN			00740	*DONT ERASE WHAT'S THERE
	00210	*THE GRADIENT TABLE	005E AA	9D 0010	00750	*ADD TO IT BOOLEAN (OR)
	00220	*AND STORE ADDRESS IN X			00760	ORA [XPOS,PCR]
000D AE	00230	LOOP2 LDX TABLE,PCR	0062 A7	9D 000C	00770	*LIGHT THE PIXEL
	00240	*GET NEXT POSITION			00780	STA [XPOS,PCR]
0011 30	00250	LEAX 1,X			00790	*GET A NEW RANDOM NUMBER
	00260	*KEEP A RECORD OF HOW FAR	0066 BD	BF1F	00800	*FROM BASIC
	00270	*WE HAVE READ THE TABLE			00810	JSR \$BF1F
0013 AF	00280	STX TABLE,PCR	0069 6A	8D 0004	00820	*ONE LESS PIXEL TO LIGHT
	00290	*GET OUR FIRST VALUE	006D 20	B0	00830	DEC COUNT,PCR
0017 A6	00300	LDA ,X			00840	BRA LOOP
	00310	*HOW MANY PIXELS TO BE LIT			00850	*//////DATA//////
	00320	*SAVE IT IN count			00860	*START OF GRAPHICS SCREEN
0019 A7	00330	STA COUNT,PCR	006F		00870	LINE RMB 2
001D 81	00340	CMPS #0			00880	*PIXELS PER LINE
001F 26	00350	LOOP BNE CONT	0071		00890	COUNT RMB 1
	00360	*NO MORE PIXELS TO LIGHT?			00900	*BYTE TO BE CHANGED
	00370	*THEN MOVE TO NEXT LINE	0072		00910	XPOS RMB 2
0021 EC	00380	LDD LINE,PCR			00920	*WHICH PIXEL IN A BYTE
	00390	*ONE PMODE4 LINE =32 BYTES	0074		00930	MASK RMB 1
0025 C3	00400	ADD #32			00940	*WHICH SCREEN LINE ARE WE
	00410	*SAVE IT			00950	*ON?
0028 ED	00420	STD LINE,PCR	0075		00960	PASS RMB 1
002C 6A	00430	DEC PASS,PCR			00970	*//////TABLE//////
	00440	*FINISHED THE SCREEN YET?			00980	*FIRST ITEM
0030 26	00450	BNE LOOP2			00990	*USE NEXT
0032 39	00460	RTS			01000	*THE REST
	00470	*TO LIGHT SOME PIXELS	0076		01010	*PER LINE AS SKY BRIGHTENS
	00480	*GET A RANDOM NUMBER		0000	01020	TABLE RMB 2
	00490	*MASK OUR BYTES FOR PIXELS			01030	END
	00500	*PER BYTE. MODULUS MATH	00000	TOTAL ERRORS		
0033 86	00510	CONT LDA #\$C0 \$11000000	BYTE	004B		
0035 A7	00520	STA MASK,PCR	CONT	0033		
0039 F6	00530	LDB 278 RND(255)	COUNT	0071		
003C 27	00540	BEQ SET	LINE	006F		
	00550	*FIND MODULUS #4	LOOP	001F		
003E C4	00560	ANDB #3	LOOP2	000D		
0040 27	00570	BEQ BYTE	M1	0042		
0042 44	00580	LSRA SHIFT RIGHT	MASK	0074		
0043 44	00590	LSRA # IN A REG.	PASS	0075		
0044 5A	00600	DECB	SET	0051		
0045 26	00610	BNE M1	TABLE	0076		
0047 A7	00620	STA MASK,PCR	XPOS	0072		
004B F6	00630	BYTE LDB 278				

## Match and Learn

### Program Listing. Match and Learn

```

10 GOSUB100 'INSTRUCTIONS
20 GOSUB200 'MAKE 2 LISTS
30 GOSUB 300 'CHOOSE RANDOMLY
40 GOSUB 400 'DISPLAY SCRAMBLED
50 GOSUB 500 'INPUT AND SCORE
60 CLS:PRINT@160,"YOU GOT "ANSWE
RS" ANSWERS CORRECT"
70 PRINT"THAT WAS OUT OF 100"
80 PRINT:FORX=1TO32:PRINT"-";;NE
XTX:PRINT"WOULD YOU LIKETO"
89 PRINT" ";

```

```

90 PRINT"PLAY AGAIN(1)
SEE CORRECT ANSWERS(2)
END(3)
91 A$=INKEY$:IF A$="" THEN91
92 IF A$="1"THEN RUN
93 IF A$="3"THEN97
94 IF A$<>"2"THEN60
95 CLS:FOR I=0TO9
96 PRINT FIRST$(I),SECOND$(I):NE
XT
97 FORX=1TO10:PRINT" ";NEXTX:PR
INT:PRINT"GOODBYE--"
98 END
99 'INSTRUCTIONS AND INITIALIZE

```

```

100 CLS
101 PRINT:PRINT:PRINT:FORX=1TO32
:PRINT"#";NEXTX
102 PRINT"THIS IS A GAME FOR
MATCHING TWO LISTS THAT WILL BE
SHOWN TO YOU. MOVE THE BLINKING
CURSOR WITH THE"
103 PRINT@232," UP AND DOWN ARRO
W KEYS AND PRESS @ WHEN THE CURS
OR IS OPPOSITE THE ITEM MAKED BY
THE -. G O O D L U C K I "
105 FORX=1TO32:PRINT"#";NEXTX:P
RINT

```

Listing continued



```

107 PRINT"      press any key to b
egin"
108 IF INKEY$="" THEN PRINT@222,
" ";:FORQW=1TO30:NEXT:PRINT@222,
CHR$(128);:FORQW=1TO100:NEXT:GOT
0108
110 DIM F$(100),S$(100),COUNTER(
100)
115 CLS
120 RETURN
199 'MAKE LISTS
200 I=1
210 READ F$(I),S$(I)
220 IFF$(I)<>"-1" THEN I=I+1:GOT
0210
230 MAX=I-1:RETURN
299 'CHOOSE RANDOMLY
300 FOR I= 0 TO 9
310 N=RND(MAX)
320 IF COUNTER(N)<>0 THEN 310'IT
EM CHOSEN ALREADY
330 FIRST$(I)=F$(N):SECOND$(I)=S
$(N)
340 COUNTER(N)=1:REM ITEM UNAVAI
LABLE FROM NOW ON
350 NEXT I
360 RETURN
399 'SCRAMBLE & DISPLAY
400 FOR I=0 TO 9
410 PRINT FIRST$(I),
420 N=RND(10)-1
430 IF KOUNTER(N)=1 THEN 420
440 PRINT SECOND$(N):KOUNTER(N)=
1
445 TWO$(I)=SECOND$(N)
450 NEXT I
455 Z=RND(127)+128:FORX=1TO32:PR
INT CHR$(Z);:NEXT
457 PRINT:PRINT" pointer - poin
ts to left list cUrSoR refers
to right list
460 RETURN
499 'INPUT & SCORE
500 FORI=0 TO 9
510 PRINT@32*I+13,"_-";
520 X=32*I+13+16
530 PRINT@X,CHR$(128);
540 AS=INKEY$
545 FOR PK=341TO344:POKE PK,255:
NEXT
550 IF AS<>"^" AND AS<>CHR$(10)
AND AS<>"@" THEN PRINT@X," ";:PO
RQ=1TO30:NEXT:PRINT@X,CHR$(128);
:FORQW=1TO100:NEXT:GOTO540
560 IF AS=@" THEN GOSUB 600:NEX
T I:RETURN
570 PRINT@X," ";
580 IF AS="^" THEN X=X-32:GOTO58
5
582 X=X+32
585 IF X<0 THEN X=X+32
587 IF X>320 THEN X=X-32
590 GOTO 530
599 'SCORE ETC.
600 SOUND 80,1
605 J=(X-29)/32
610 IF TWO$(J)=SECOND$(I) THEN A
NSWERS=ANSWERS+1
620 PRINT@32*I,"
";
630 PRINT@32*J+16,"
";
640 RETURN
900 DATA ONE, 1, TWO,2,THREE,3,F
OUR,4,FIVE,5,SIX,6,SEVEN,7
910 DATA EIGHT,8,NINE,9,TEN,10,E
LEVEN,11
920 DATA FEMUR,LEG,CRANIUM,HEAD,
STERNUM,CHEST,RETINA,EYE
930 DATA PARIS,FRANCE,BUENOS AIR
ES,ARGENTINA,BOMBAY,INDIA,RIO,BR
AZIL
940 DATA ABSCISSA,ORDINATE,DIFFE
RENTIATE,INTEGRATE,VECTOR,SCALAR
,REAL,IMAGINARY
950 DATA CLEOPATRA,ELIZABETH,ZOR
BA,ANTHONY,MOSES,CHARLTON,SPOCK,
LEONARD
999 DATA -1,-1
1000 'PLACE WHATEVER DATA LINES
YOU LIKE BETWEEN 640 AND 999.
INSERT MATCHING ITEMS IN PAIRS.

```

## Digitize Me!

### Program Listing 1. The Machine-Language Digitization Routines

```

00010 *      *      *      *
00020 *      DIGITIZATION      *
00030 *      ROUTINES          *
00040 *      BY                  *
00050 *      JEFF RUBIDGE      *
00060 *      *      *      *
00100      ORG      $3F00
00110 READ      CLRB
00120      JSR      $A99D      TURN AUDIO ON
00130      JSR      $A7CA      TURN MOTOR ON
00140 KEY      JSR      [$A000] CHECK KEYBOARD
00150      BEQ      KEY      REPEAT IF NOT PRESSED
00160      CMPA      #3      BREAK KEY?
00170      BEQ      ABORT      RETURN TO BASIC IF BREAK
00180      ORCC      $50      TURN OFF INTERRUPTS
00190      STA      $FFDF      TURN ON 64K MODE
00200      LDX      $4000      X=POSITION IN BUFFER
00210      LEAU      <BITT,PCR      GET BIT TABLE AT U
00215 *
00220 BYTE      CLRB      CLEAR BIT COUNTER
00230      CLR      <0      CLEAR SCRATCH BYTE
00240 BIT      LDA      $FF20      GET CASSETTE INPUT
00250      ANDA      #1      CHECK BIT 0
00260      BEQ      NO      IF 0 SKIP BIT SET
00270 YES      LDA      <0      IF 1 SET BIT IN SCRATCH BYTE
00280      ORA      B,U      SET BIT USING BIT TABLE
00290      STA      <0      GOES INTO SCRATCH BYTE
00300      BRA      CONT
00310 NO      LDA      <0      WASTE TIME
00320      ORA      B,U      EXACTLY AS ABOVE-
00330      LDA      <0      BUT BIT IS NOT SET
00340      BRA      CONT
00350 CONT      INCB      INCREASE BIT COUNTER
00360      CMPB      #8      IS BYTE FULL?
00370      BLO      BIT      IF NOT, GET ANOTHER BIT
00380      LDA      <0      IF FULL, GET SCRATCH BYTE
00390      STA      ,X+      AND STORE IT IN BUFFER
00400      CMPX      $FFF00      IS BUFFER FULL?
00410      BLO      BYTE      IF NOT, GET ANOTHER BYTE
00415 *
00420      STA      $FFDE      TURN OFF 64K MODE
00430 ABORT      JSR      $A7EB      TURN OFF MOTOR
00440      RTS      BACK TO BASIC
00445 *
00450 BITT      FDB      $8040      BIT TABLE USED BY BOTH ROUTINES
00460      FDB      $2010
00470      FDB      $0804
00480      FDB      $0201
00485 *
00490 PLAY      ORCC      $50      TURN OFF INTERRUPTS
00500      LDA      $FF23      ENABLE SOUND
00510      ORA      #8      SET BIT 3
00520      STA      $FF23
00530      LDA      $FF01      MULTIPLEXER CONTROL, HIGH BIT
00540      ANDA      #F7      RESET BIT 3
00550      STA      $FF01
00560      LDA      $FF03      MULTIPLEXER CONTROL, LOW BIT
00570      ANDA      #F7      RESET BIT 3
00580      STA      $FF03
00590      STA      $FFDF      TURN ON 64K MODE
00600      LEAU      <BITT,PCR      GET BIT TABLE AT U
00610      LDX      $4000      X=POSITION IN BUFFER
00615 *
00620 BYTE2      LDA      ,X+      GET BYTE FROM BUFFER
00625      STA      <0      STORE IN SCRATCH BYTE
00630      CLRB      CLEAR BIT COUNTER
00640 BIT2      LDA      <0      GET CURRENT BUFFER BYTE
00650      BITA      B,U      EXTRACT BIT USING BIT TABLE
00660      BEQ      LOW      IF BIT IS 0 LOW SOUND
00670 HIGH      LDA      $SFC      ELSE HIGH
00680      BRA      CONT2
00690 LOW      LDA      #0
00700      BRA      CONT2
00710 CONT2      STA      $FF20      OUTPUT TO DAC TO MAKE SOUND
00720      BRA      DELAY      THIS BRANCH
00730      NOP      CAN BE CHANGED
00740      NOP      SO LOOP INCLUDES MORE NOP'S
00750      NOP      THUS SLOWING DOWN
00760      NOP      THE SOUND
00770      NOP
00780      NOP
00790      NOP
00800      NOP
00810      NOP
00820      NOP
00830      NOP
00840      NOP
00850      NOP
00860      NOP
00870      NOP
00880      NOP
00890      NOP
00910 DELAY      INCB      INCREASE BIT COUNTER
00920      CMPB      #8      ALL BITS DONE?
00930      BLO      BIT2      IF NOT, REPEAT
00940      CMPX      $FFF00      FINISHED ENTIRE BUFFER?
00950      BLO      BYTE2      IF NOT, GET NEXT BYTE
00955 *
00960      STA      $FFDE      TURN OFF 64K MODE
00970      RTS      BACK TO BASIC
00980      END
00000 TOTAL ERRORS

```



## Program Listing 2. Digitize

```

1 ' *****DIGITIZ*****
2 ' 64K EXTENDED BASIC
3 ' BY JEFF RUBIDGE
4 ' BOX 855, BATTLEFORD, SASKATCHE
WAN
5 ' CANADA S0M 0E0
6 '
10 CLEAR200, &H3F00
20 ML=&H3F00:RD=ML:PL=ML+&H53:SP
=ML+&H8D
30 IFPEEK(RD)<>&H5F AND PEEK(PL)
<>&H1A THENCLS8:PRINT"YOU MUST L
OAD 'DIGIML':END
40 GOTOL10
50 '*** PLAY (S=START MSB E=END
MSB)
60 IFS>E THENSTOPELSEPOKEML+&H7
4,S:POKEML+&H5,E:EXECPL:RETURN
70 '*** READ (S=START MSB E=END
MSB)
80 IFS>E THENSTOPELSEPOKEML+&H1
7,S:POKEML+&H40,E:EXECRD:RETURN
90 '*** HEX INPUT SUBROUTINE
100 IS=INKEY$:IFIS=""THEN100ELSE
N=INSTR("0123456789ABCDEF",IS)-1
:RETURN
110 NS=15:DIMS(NS),E(NS)
120 '*** MAIN PROGRAM LOOP
130 FORQ=0TO15:S(Q)=&H40+Q*12:E(
Q)=&H40+Q*12+12:NEXT:E(15)=&HFF
140 CLS7:CLS0:PRINT"choices":PR
INT"1. PLAY ENTIRE BUFFER:PRINT"
2. READ ENTIRE BUFFER:PRINT"3.
PLAY SECTION":PRINT"4. READ SEC
TION":PRINT"5. REDEFINE SECTION"
:PRINT"6. CHANGE SPEED":PRINT"7.
VIEW":PRINT"8. END"
150 IS=INKEY$:IFIS=""THEN150
160 ONVAL(IS)GOSUB10,210,230,27
0,300,350,380,430
170 GOTOL40
180 '*** PLAY ENTIRE BUFFER
190 S=&H40:E=&HFF:GOSUB 60:RETUR
N
200 '*** READ ENTIRE BUFFER
210 INPUT"POSITION TAPE, PRESS <
PLAY>, THEN TYPE <ENTER>":AS:
S=&H40:E=&HFF:GOSUB80:RETURN
220 '*** PLAY A SECTION
230 PRINT:PRINT:PRINT"TYPE HEX 0
-F":PRINT"ANYTHING ELSE TO RE
TURN"
240 GOSUB100:IFN=-1THENRETURN
250 S=S(N):E=E(N):IFS=0ANDE=0THE
NSTOPELSEGOSUB60:GOTO240
260 '*** READ A SECTION
270 PRINT:PRINT:PRINT"WHICH SECT
ION (0-F)":PRINT"ANYTHING ELSE T
O RETURN":GOSUB100:IFN=-1THENRET
URN
280 S=S(N):E=E(N):GOSUB 80:RETUR
N
290 '*** REDEFINE SECTION
300 CLS3:FORQ=0TO15:PRINT@Q*32,H
EX$(Q)". "HEX$(S(Q))" "HEX$(E(
Q)):NEXT
310 PRINT@16,,:INPUT"SECTION":AS
:A=VAL("&H"+AS):IFA<0ORA>15THEN3
10
320 PRINT@14+32*A,,:INPUT"START"
;SS:S(A)=VAL("&H"+SS):PRINT@14+3
2*A,,:INPUT"END":ES:E(A)=VAL("&H
"+ES):IFS(A)>=E(A)THEN320
330 RETURN
340 '*** SPEED
350 CLS0:PRINT"CURRENT SPEED ="P
EEK(SP):PRINT:INPUT"CHANGE TO (0
-17)":N:IFN<0ORN>17THEN350
360 POKESP,N:RETURN
370 '*** VIEW GRAPHICS OF SOUND
BUFFER
380 PMODE4,1:OF=&H40
390 POKE&HBA,OF:SCREEN1,1
400 IF PEEK(341)=247 THEN OF=OF-
2:IFOF<0THENOF=OF+256:GOTO390ELS
E390

```

```

401 IFPEEK(342)=247THENOF=OF+2:I
FOF>255THENOF=OF-256:GOTO390ELSE
390
410 IFINKEY$="R"THENRETURNELSE40
0
420 ' THE END
430 CLS:PRINTTAB(10)"SO LONG..."
:END

```

## Program Listing 3.

## A Basic Program to Build the Machine-language Routines in Memory

```

10 ' BASIC PROGRAM TO BUILD THE
MACHINE LANGUAGE ROUTINES IN MEM
ORY
20 ' CHECKS YOUR TYPING
30 ' SAVES IT TO TAPE
40 CLEAR200, &H3F00
50 ML=&H3F00 'START OF PROGRAM
60 READ A:IF A=-1 THEN90
70 POKE ML+T,A:CH=CH+A
80 T=T+1:GOTO60
90 PRINT CH:IF CH<>"159 OR T<>1
73 THEN PRINT"DATA ERROR- CHECK
YOUR TYPING":END
100 CLS0:PRINT"DONE"
110 PRINT"POSITION TAPE AND PRES
S <RECORD>":PRINT"PRESS ANY KEY
TO SAVE THE DIGITIZATION S
UBROUTINES AS 'DIGIML':IS=I
NKEY$
120 IFINKEY$=""THEN120
130 CSAVEM"DIGIML", &H3F00, &H3FAD
, &H3F53
140 END
150 DATA 95,189,169,157,189,167,
202,173,159,160,0
160 DATA 39,250,129,3,39,54,26,8
0,183,255
170 DATA 223,142,64,0,51,140,47,
95,15,0
180 DATA 182,255,32,132,1,39,8,1
50,0,170
190 DATA 197,151,0,32,8,150,0,17
0,197,150
200 DATA 0,32,0,92,193,8,37,228,
150,0
210 DATA 167,128,140,255,0,37,21
6,183,255,222
220 DATA 189,167,235,57,128,64,3
2,16,8,4
230 DATA 2,1,26,80,182,255,35,13
8,8,183
240 DATA 255,35,182,255,1,132,24
7,183,255,1
250 DATA 182,255,3,132,247,183,2
55,3,183,255
260 DATA 223,51,140,216,142,64,0
,166,128,151
270 DATA 0,95,150,0,165,197,39,4
,134,252
280 DATA 32,4,134,0,32,0,183,255
,32,32
290 DATA 17,18,18,18,18,18,18,18
,18,18
300 DATA 18,18,18,18,18,18,18,18
,92,193
310 DATA 8,37,215,140,255,0,37,2
05,183,255
320 DATA 222,57,-1

```

## Program Listing 4. A Basic Loader

```

10 ' TAPE CHAINING PROGRAM
20 ' LOADS 'DIGIML'
30 ' DIGITIZES SOUND
40 ' THEN LOADS YOUR PROGRAM
50 CLEAR200, &H3F00:CLS0:PRINT@20
4,"loading";
60 CLOADM:POKE&H3F0B,&H21 'LOADS
'DIGIML', THEN ALTERS PROGRAM S
O YOU DO NOT NEED TO PRESS A KEY
TO BEGIN DIGITIZATION
70 CLS:PRINT"TURN VOLUME UP(ON T
APE RECORDER)":
80 IFINKEY$=""THEN80
90 EXEC&H3F00 'DIGITIZES SOUND
100 CLS:PRINT"TURN VOLUME DOWN"
110 IFINKEY$=""THEN110
120 CLS4:PRINT"TYPE 'RUN' AFTER
PROGRAM IS LOADED"
130 CLOAD 'LOADS YOUR PROGRAM

```

## Closed For Inventory

## Program Listing. Inventory

```

10 CLEAR4500:GOTO14
12 PRINT@320," NUMBER OF LINES
PER PAGE":PRINT@352," (STANDARD
PAGE IS 55 LINES":INPUTY7:RETU
RN
14 DIMT(220),S(220),I(220),P3(22
0),B(220),P(220),N(1),D$(220):GO
TO32
16 PRINT#-2,"":RETURN
18 FORAA=1TO61-Y7:PRINT#-2,"":NE
XT:RETURN
19 SOUND2,2:FORX=0TO1800:NEXT:RE
TURN
20 W=W+32
22 PRINT@W,"":RETURN
24 W=226:GOTO22
26 CLS1:W=229:GOSUB22:INPUT"ROW
# OF ITEM ":A:IFA>N(1)THEN48ELSE
RETURN
28 SOUND2,3:FORX=0TO1700:NEXT:GO
TO26
30 FORM=1TO80:PRINT#-2,"=":NEXT
:RETURN
32 F8=0:G=1:CLS1:W=0:GOSUB20:INP
UT" IS THIS NEW INVENTORY
(1= YES 2= NO)":X:IFX=
2THEN50
34 AA=0:GOSUB20:INPUT"HOW MANY S
TOCK NUMBERS ":N(1)
36 AA=AA+1:IF AA>N(1)THEN AA=AA-
1:GOTO50 ELSE GOSUB20:PRINT"ROW
NUMBER ":AA:GOSUB20:INPUT"ITEM
NUMBER ":S(AA):GOSUB20:PRINT"DES
CRIPTION (20 CHARACTERS MAX)"
38 POKE1305,191:W=259:GOSUB22:IN
PUTD$(AA)
40 W=256:GOSUB20:INPUT"QUANTITY
IN STOCK ":I(AA):GOSUB20:INPUT"Q
UANTITY PURCHASED ":B(AA):GOSUB2
0:INPUT"NET PRICE ":P(AA):GOSUB2
0:INPUT"LIST PRICE ":P3(AA):GOSU
B20:INPUT"AMOUNT OWED ":T(AA)
42 IFB(AA)>I(AA)THENB(AA)=B(AA)-
I(AA):GOTO45
44 I(AA)=I(AA)-B(AA):B(AA)=0
45 IFI(AA)<1THENI(AA)=P(AA)*B(AA
)
46 GOSUB20:INPUT"1 = QUIT ":W:CL
S1:IFW=1THEN N(1)=AA:GOTO50 ELSE
36
48 CLS0:SOUND2,1:PRINT@130,"HIGH
EST ROW IN USE IS ":N(1):GOTO19
50 CLS1:PRINT@11,"COMMANDS":PRIN
T@69,"1 CHANGE ITEM #":PRINT@10
1,"2 MARK FOR DELETION":PRINT@1
33,"3 DELETION PROCESS"
52 PRINT@165,"4 REPORTS TO PRIN
TER":PRINT@197,"5 ADD NEW ITEM"
:PRINT@229,"6 SAVE DATA":PRINT@
261,"7 LOAD DATA":PRINT@293,"8
LIST DISK FILES"
54 INPUTX:CLS1:ON X GOSUB 100,17
2,174,96,70,85,78,180:GOTO50
56 GOSUB26:PRINT@263,"IN STOCK "
:I(A):PRINT@293,"BACK ORDERED "
:B(A):PRINT@320," BK ORDERS FILLE
D ":INPUTD
58 IFD>I(A)THENPRINT"YOU ONLY HA
VE ":I(A):" IN STOCK":GOSUB28:GO
TO56
60 IFD>B(A)THENPRINT"YOU ONLY HA
VE ":B(A):" ON BACK ORDER":GOSUB
28:GOTO56
62 B(A)=B(A)-D:I(A)=I(A)+D:RETUR
N
64 PRINT#-2,TAB(30)"BACK ORDER R
EPORT #":XX:PRINT#-2,"":PRINT#-2
," ROW ITEM QTY ON NET
B.O. NET LIST":PRINT
#-2," NO. NO. B.O. FOR
1 TOTAL PRICE"
66 FR$="### ####, ####, $$$
#.# $#####.## $#####.##
":GOSUB30
68 A=A+1:P2=P(A)*B(A):PRINT#-2,U
SINGR$A,S(A),B(A),P(A),P2,P3(A)

```







# Listing continued

```
500 DATA 0, 65, 82, 82, 65, 89,
32, 86
510 DATA 65, 82, 73, 65, 66, 76,
69, 83
520 DATA 32, 32, 0, 0, 0, 0, 25
5, 0
```

## Program Listing 2. Number Dump

```
5 REM NUMDUM
10 FOR I= 32000 TO 32119
20 READ X
30 POKE I,X
40 NEXT I
60 DATA 52, 119, 189, 179, 237,
52, 6, 134
70 DATA 254, 151, 111, 134, 13,
189, 162, 130
80 DATA 16, 158, 27, 51, 141, 0,
85, 141
90 DATA 19, 141, 42, 16, 156, 2
9, 45, 247
100 DATA 134, 13, 189, 162, 130,
53, 6, 189
110 DATA 180, 244, 53, 247, 236,
164, 49, 39
120 DATA 77, 42, 4, 15, 111, 32,
245, 93
130 DATA 42, 4, 50, 98, 32, 221,
38, 2
140 DATA 198, 32, 237, 69, 57,
158, 166, 52
150 DATA 16, 189, 162, 130, 31,
152, 189, 162
160 DATA 130, 134, 61, 189, 162,
130, 223, 166
170 DATA 166, 196, 28, 254, 189,
173, 198, 134
180 DATA 254, 151, 111, 51, 141,
0, 5, 53
190 DATA 16, 159, 166, 57, 135,
35, 172, 50
200 DATA 44, 65, 32, 44, 0, 36,
0, 255
```

## Program Listing 3. String Dump

```
5 REM STRLIS
10 FOR I= 32000 TO 32186
20 READ X
30 POKE I,X
40 NEXT I
60 DATA 52, 119, 134, 254, 151,
111, 134, 13
70 DATA 189, 162, 130, 16, 158,
27, 51, 141
80 DATA 0, 155, 141, 16, 141, 4
6, 16, 156
90 DATA 29, 45, 247, 134, 13, 1
89, 162, 130
100 DATA 15, 111, 53, 247, 236,
164, 141, 93
110 DATA 49, 39, 77, 42, 4, 49,
39, 32
120 DATA 243, 193, 128, 36, 4,
50, 98, 32
130 DATA 221, 193, 128, 38, 2,
198, 160, 192
140 DATA 128, 237, 69, 57, 109,
141, 0, 100
150 DATA 38, 58, 158, 166, 52,
16, 189, 162
160 DATA 130, 31, 152, 189, 162,
130, 134, 36
170 DATA 189, 162, 130, 134, 61,
189, 162, 130
180 DATA 134, 34, 189, 162, 130,
223, 166, 166
190 DATA 196, 28, 254, 189, 173,
198, 134, 254
200 DATA 151, 111, 51, 141, 0,
55, 53, 16
210 DATA 159, 166, 134, 34, 189,
162, 130, 134
220 DATA 10, 189, 162, 130, 57,
52, 6, 111
230 DATA 141, 0, 33, 230, 34, 1
74, 36, 166
240 DATA 128, 141, 5, 90, 38, 2
49, 53, 134
250 DATA 129, 32, 39, 8, 129, 4
```

```
8, 45, 5
260 DATA 129, 128, 36, 1, 57, 1
34, 1, 167
270 DATA 141, 0, 1, 57, 5, 135,
35, 172
280 DATA 50, 44, 65, 65, 36, 59,
0, 32
290 DATA 0, 255, 0, 255, 0, 255
, 0, 255
```

## Program Listing 4. Basic Program Illustrating Use of All Three Utilities

```
5 DIM A$(10),BG(10,10)
10 DATA ONE,TWO,THREE,FOUR,FIVE
20 X=3.1416
25 EXEC &H7D00
30 FOR JJ=1 TO 5
35 B(JJ)=JJ
40 Y1=RNDD(0)
50 X=X+Y1
60 READ Z$
70 EXEC &H7D00
80 NEXT
```

## Timer Value Demonstration

```
10 A=1:B=0:C=0:D=0:E=0:F=0:G=0:H
=0:I=0:J=0:K=0
20 Y=1024:Z=1535
30 TIMER=0
40 FOR X=Y TO Z
50 POKE X,1
60 NEXT:PRINT TIMER
```

## Five Card CoCo

### Program Listing. Blackjack

```
10 CLEAR1000
20 PCLEAR8
25 PMODE3,5:PCLS
26 PMODE3,1:PCLS2
30 DIMD(52),P(10,3,7),T1(3),T2(3
),T(3),S(52),G(13,4),V(54,4),FLA
G(3),PIPS(4),DS(15),CS(4)
40 CLS
50 PRINT@172,"BLACKJACK"
60 "MICHAEL J. MEFFORD
65 "PO. BOX 351
67 "GLENEDEN BEACH OR. 97388
70 GOTO10010
71 FORX=2TO54STEP4
72 PSET(X,1,3):PSET(X,2,3):PSET(
X+2,3,3):PSET(X+2,4,3):NEXT
73 GET(2,1)-(56,4),V,G
85 FOR Z=1TO10
90 FOR X=0TO2
100 FOR Y=0TO6
110 READ P(Z,X,Y)
120 NEXT:NEXT:NEXT
123 CLS
129 PRINT@9,"*INSTRUCTIONS*"
130 PRINT@34,"*****
*****"
131 PRINT@66,"*KEY'B'*FOR EACH D
OLLAR BET*"
132 PRINT@98,"*KEY'T'*FOR EACH $
10.00 BET*"
133 PRINT@130,"*KEY'5'*FOR EACH
$5.00 BET *"
134 PRINT@162,"*KEY'D'*TO DEAL
*"
135 PRINT@194,"*KEY'D'*TO DOUBLE
DOWN *"
136 PRINT@226,"*KEY'P'*TO SPLIT
A PAIR *"
137 PRINT@258,"*KEY'H'*TO HIT
*"
138 PRINT@290,"*KEY'S'*TO STAND
*"
139 PRINT@322,"*KEY'Q'*TO QUIT
*"
143 PRINT@418,"HERE'S A $20.00 M
ARKER":PRINT@442,CHR$(186)
144 PRINT@450,"PRESS ANY KEY TO
START.;"
145 S=20.00:BO$="+20":GOSUB1000
146 KEYS=INKEY$:IFKEY$=""THEN146
ELSECLS
147 INPUT"ENTER YOUR NAME";NA$:C
LS
```

```
150 PMODE3,1:PCLS
153 IFS<1THENFORX=1TO500:NEXT:GO
SUB10600
154 GOSUB50000
155 DD=0:SD=0:SS=0:BS=0:BJ=0:DF=
0:DP=0:BJ=0:SP=0:F=0:D=0:E=0:B=0
:FORX=1TO3:T1(X)=0:T2(X)=0:T(X)=
0:FLAG(X)=0:NEXT
170 COLOR2:LINE(132,0)-(244,15),
PSET,BF
180 COLOR4:LINE(132,0)-(244,15),
PSET,B
220 COLOR3
240 DRAW"BM132,0"+BS+MS+L$+MS+DS
(1)+MS+CK$+MS+DS(13)
241 DRAW MS+DS(11)+MS+DS(1)+MS+C
K$+MS+DS(13)
250 DRAW"BM132,17C2"+SS+MS+CK$+M
S+DS(0)+MS+RS+MS+ES
260 DRAW "BM132,31"+DS$
270 DRAW"BM132,45"+BS+MS+ES+MS+T
$+"BM132,59"+DS$
280 GOSUB 35000
285 IF CC>37THENDRAW"BM132,73C3"
+SS+MS+HS+MS+US+MS+FS:DRAWMS+FS+
MS+LS+MS+ES:SOUND200,1:GOSUB3500
:GOSUB1000:COLOR1:LINE(130,76)-(
255,85),PSET,BF:SOUND200,1:GOSUB
35000
300 "INKEY
305 Z$=INKEY$
310 KEYS=INKEY$:IFKEY$=""THEN GO
TO 310
320 IF KEYS="B" AND S>=1 THENB=B
+1:S=S-1:GOSUB 45000:SOUND120,1:G
OSUB35000
325 IF KEYS="5" AND S>=5 THEN B=
B+5:S=S-5:GOSUB45000:SOUND120,1:G
OSUB35000
327 IF KEYS="T" AND S>=10 THEN B
=B+10:S=S-10:GOSUB45000:SOUND120,
1:GOSUB35000
330 IF KEYS="D" AND B>0 THEN GOT
O 500
335 IFKEY$="Q"THEN10900
340 GOTO 305
500 "DEAL
510 FORQ=1TO2
520 CC=CC+1:CARD=D(CC):SUIT=S(CC
):GOSUB20000:M=2:GOSUB30000:GOSUB3
5000
530 CC=CC+1:CARD=D(CC):SUIT=S(CC
):GOSUB15000:M=1:GOSUB30000:GOSUB3
5000
540 NEXT
550 GOSUB55000:IF BJ>0THEN FORX=1
TO500:NEXT:GOTO1500
600 "INKEY
610 Z$=INKEY$
615 KEYS=INKEY$:IF KEYS=""THEN61
5
620 IFKEY$="H"THEN7000
630 IFKEY$="S"THENIFDP=0ORSP=1TH
EN7500ELSESP=1:GOSUB65000:GOSUB55
000:IFT(2)>21ORT(2)<22AND E=5THEN
IFBJ>0THENGOSUB85000:GOSUB35000:F
ORX=1TO500:NEXT:GOTO1500
640 IFKEY$="P" AND D(CC-1)=D(CC-
3) AND DF=0 AND S>=B THENGOSUB65
000
650 IFSS=1THEN1500
660 IFBS=1THEN7500
665 IFKEY$="D" AND S>=B AND F=2T
HENIFT(3)=10ORT(3)=11THENS=S-B:B
=B*2:GOSUB45000:B=B/2:GOSUB90000:C
C=CC+1:CARD=D(CC):SUIT=S(CC):GOS
UB70000:M=3:GOSUB30000:GOSUB35000:S
D=1:GOTO75000
670 IFKEY$="D" AND S>=B AND E=2T
HENIFT(2)=10ORT(2)=11THENS=S-B:B
=B*2:GOSUB45000:B=B/2:GOSUB90000:C
C=CC+1:CA=D(CC):SU=S(CC):GOSUB20
000:M=2:GOSUB30000:GOSUB35000:DD=1:
SP=1:IFDP=1THENGOSUB45000:COLOR1:
LINE(130,76)-(255,85),PSET,BF:GO
SUB35000:GOSUB65000ELSE75000
690 GOTO610
700 "HIT
710 DF=1:CC=CC+1:CARD=D(CC):SUIT
=S(CC)
720 IFSP=0THENGOSUB20000:M=2:GOSU
B30000:GOSUB35000:IF E=5 AND T(2)<
22THENDRAWFIS+CP$+WIS:GOSUB3500
:S=S+(3*B):GOSUB50000:PLAYMBS:GOSU
```



```

B3500: IFDP=0 THEN GOSUB 8500: GOSUB 3
500: FORX=1 TO 500: NEXT: GOTO 150 ELSE
SP=1: GOSUB 6500: GOTO 610
730 IFSP=0 AND T(2)>21 THEN DRAWFI$+
CP$+BU$: GOSUB 3500: SOUND 50, 5: IFDP
=0 THEN GOSUB 8500: GOSUB 3500: FORX=1
TO 500: NEXT: GOTO 150 ELSE SP=1: GOSUB
6500: GOTO 610
740 IFSP=1 THEN GOSUB 7000: M=3: GOSU
B3000: GOSUB 3500: IFP=5 AND T(3)<2
2 THEN DRAWSH$+SP$+WI$: GOSUB 3500: S
=S+(3*B): GOSUB 5000: PLAYMB$: GOSUB
3500: IFT(2)>21 OR T(2)<22 AND E=5 THE
NGOSUB 8500: GOSUB 3500: FORX=1 TO 500
: NEXT: GOTO 150 ELSE GOTO 7500
750 IFSP=1 AND T(3)>21 THEN DRAWSH$+
SP$+BU$: GOSUB 3500: SOUND 50, 4: IFT(
2)>21 OR T(2)<22 AND E=5 THEN GOSUB 8500
: GOSUB 3500: FORX=1 TO 500: NEXT: GOT
O 150 ELSE GOTO 7500
760 GOTO 610
1000 'SHUFFLE
1010 FORX=1 TO 13: FORY=1 TO 4: G(X,Y)
=0: NEXT: NEXT
1020 FORX=1 TO 52
1030 D(X)=RND(13): S(X)=RND(4): IF
G(D(X), S(X)) THEN 1030
1040 G(D(X), S(X))=1: NEXT
1050 CC=0: RETURN
1500 'DEALER
1510 IFQ=2 THEN GOSUB 4000: LINE(16,
4)-(73, 79), PSET, B: DC=D(CC): DS=S(
CC): RETURN
1530 COLOR 2
1540 LINE(D*16, D*4)-(57+(D*16), 7
5+(D*4)), PSET, BF
1550 COLOR 4
1560 LINE(D*16, D*4)-(57+(D*16), 7
5+(D*4)), PSET, B
1580 CD$="BM"+STR$(D*16)+"", "ST
R$(D*4): DRAW"BM0,0"+CD$
1585 GOSUB 2500
1590 IFCARD=1 AND SUIT=4 THEN PA
INT((D*16)+28, (D*4)+27), 3, 3
1600 IFCARD>10 THEN PAINT((D*16)
+28, (D*4)+20), 4, 4: PAINT((D*16)+3
4, (D*4)+38), 3, 4
1610 D=D+1: RETURN
2000 'PLAYER
2030 COLOR 2
2040 LINE(E*16, 96+(E*4))-(57+(E*
16), 171+(E*4)), PSET, BF
2050 COLOR 4
2060 LINE(E*16, 96+(E*4))-(57+(E*
16), 171+(E*4)), PSET, B
2070 CP$="BM"+STR$(E*16)+"", "ST
R$(E*4): DRAW"BM0,96"+CP$: GOSUB 25
00
2080 IFCARD=1 AND SUIT=4 THEN PA
INT((E*16)+28, (E*4)+125), 3, 3
2090 IFCARD>10 THEN PAINT((E*16)
+28, (E*4)+118), 4, 4: PAINT((E*16)
+34, (E*4)+134), 3, 4
2100 E=E+1: RETURN
2500 'DISPLAY
2510 DRAW C$(SUIT)+D$(CARD)+PIPS$(
SUIT)
2520 DRAW"BM+40,36"+PIPS$(SUIT)+"
BM-4,9"+D$(CARD)
2530 IFCARD=1 AND SUIT=4 THEN DR
AW ASS: RETURN
2540 IFCARD>10 THEN DRAW FC$: RET
URN
2550 DRAW"BM-36,-74
2560 FOR X=0 TO 2
2570 DRAW"BM+8,0"
2580 FOR Y=0 TO 6
2590 DRAW"BM+0,8"
2600 IF P(CARD,X,Y) THEN DRAW PI
PS(SUIT)
2610 NEXT: DRAW"BM+0,-56": NEXT: RE
TURN
3000 'SCORE
3005 IFCARD>10 THEN CARD=10
3010 T1(M)=T1(M)+CARD
3020 T2(M)=T2(M)+CARD
3030 IFCARD=1 AND FLAG(M)=0 THEN
T2(M)=T2(M)+10: FLAG(M)=1
3040 IFT2(M)>T1(M) AND T2(M)<22
THEN T(M)=T2(M) ELSE T(M)=T1(M)
3100 RETURN
3500 'PAGES
3510 PMODE3, 1: SCREEN 1, 0
3520 PCOPY 1 TO 5: PCOPY 2 TO 6: PCOPY 3 TO

```

```

07: PCOPY 4 TO 8
3530 PMODE3, 5: SCREEN 1, 0
3540 PMODE3, 1: RETURN
4000 'CARDBACK
4010 FORY=4 TO 7 STEP 4
4020 PUT(18,Y)-(72,Y+5), V, PSET: N
EXT: RETURN
4500 'BET
4510 BET$=STR$(B)
4520 COLOR 1
4530 LINE(150, 62)-(255, 71), PSET,
BF
4560 DRAW"BM146,59C3"
4570 FOR X=2 TO LEN(BET$)
4580 IF VAL(MID$(BET$, X, 1))=1 TH
ENDRAW D$(14)+"BM+8,-15" ELSE DR
AWD$(VAL(MID$(BET$, X, 1))+"BM+8,
-15"
4590 NEXT: DRAW"BM+4,11D1BM+0,-1
2"+D$(0)+"BM+8,-15"+D$(0): GOSUB 5
000: RETURN
5000 'DOLLARS
5010 DO$=STR$(INT(S)): CT=INT((S-
INT(S))*10)
5020 COLOR 1
5030 LINE(150, 34)-(255, 43), PSET,
BF
5100 DRAW"BM146,31C3"
5105 IF S<1 THEN 5140
5110 FOR X=2 TO LEN(DO$)
5120 IF VAL(MID$(DO$, X, 1))=1 THEN
DRAW D$(14)+"BM+8,-15" ELSE DRAW
D$(VAL(MID$(DO$, X, 1))+"BM+8,-15"
5130 NEXT
5140 DRAW"BM+4,11D1BM+0,-12"
5150 DRAW D$(CT)+"BM+8,-15"+D$(0)
5160 RETURN
5500 'BLACKJACK
5510 IFT(1)=21 AND T(2)=21 THEN GOSU
B 8500: S=S+B: GOSUB 5000: DRAWFI$+CP
$+PU$: SOUND 80, 3: GOSUB 3500: BJ=BJ+
1: RETURN
5520 IFT(1)=21 THEN GOSUB 8500: DRAW
FI$+CP$+LO$: SOUND 50, 4: GOSUB 3500:
BJ=BJ+1: RETURN
5530 IFT(2)=21 THEN S=S+(B*2.5): GO
SUB 8500: DRAWFI$+CP$+WI$: GOSUB 3500
: PLAYCH$: GOSUB 5000: PLAYMB$: GOSU
B 3500: BJ=BJ+1: RETURN
5540 RETURN
6000 'DOUBLE
6510 IFSP=0 AND DP=0 THEN DP=1: S=S-
B: GOSUB 5000: GOSUB 9200: COLOR 1: LIN
E(57, 100)-(73, 170), PSET, BF: LINE(
16, 171)-(73, 175), PSET, BF: CARD=D(
CC-3): SUIT=S(CC-3): E=0: GOSUB 2000
: T1(2)=0: T2(2)=0: FL(2)=0: M=2: GOS
UB 3000
6520 IFSP=0 AND DP=0 THEN DP=1: CARD
=D(CC-1): SUIT=S(CC-1): GOSUB 7000:
M=3: GOSUB 3000: GOSUB 3500: CC=CC+1:
CARD=D(CC): SUIT=S(CC): GOSUB 2000:
M=2: GOSUB 3000: GOSUB 3500: IFT(2)=2
1 THEN S=S+(B*2.5): DRAWFI$+CP$+WI$
: GOSUB 3500: PLAYCH$: SP=1: GOSUB 5000
: PLAYMB$: GOSUB 3500
6530 IFSP=1 THEN CC=CC+1: CARD=D(CC)
: SUIT=S(CC): GOSUB 7000: M=3: GOSUB
3000: GOSUB 3500: IFT(3)=21 THEN S=S+
(B*2.5): DRAWSH$+SP$+WI$: GOSUB 3500
: PLAYCH$: GOSUB 5000: PLAYMB$: GOSU
B 3500
6540 IFT(2)=21 AND T(3)=21 AND F=2 T
HEN IF E=20 THEN 5 THEN GOSUB 8500: GOSU
B 3500: FORX=1 TO 500: NEXT: SS=1: RETU
RN
6550 IFT(3)=21 THEN BS=1
6560 RETURN
7000 'PLAYER#2
7010 COLOR 2
7020 LINE(128+(F*16), 96+(F*4))-(
185+(F*16), 171+(F*4)), PSET, BF
7030 COLOR 4
7040 LINE(128+(F*16), 96+(F*4))-(
185+(F*16), 171+(F*4)), PSET, B
7050 SP$="BM"+STR$(F*16)+"", "ST
R$(F*4): DRAW"BM128,96"+SP$: GOSUB
2500
7060 IFCARD=LANDSUIT=4 THEN PAINT(
(F*16)+156, (F*4)+125), 3, 3
7070 IFCARD>10 THEN PAINT((F*16)+1
56, (F*4)+118), 4, 4: PAINT((F*16)+1

```

```

62, (F*4)+134), 3, 4
7080 F=F+1: RETURN
7500 'DEAL DEALER
7510 GOSUB 8500: GOSUB 3500
7530 IFT(1)<16 THEN CC=CC+1: CARD=
D(CC): SUIT=S(CC): GOSUB 1500: M=1: G
OSUB 3000: GOSUB 3500: GOTO 7530
7540 IFT2(1)=17 AND FL(1)=1 THEN CC
=CC+1: CARD=D(CC): SUIT=S(CC): GOSU
B 1500: M=1: GOSUB 3000: GOSUB 3500: GO
TO 7530
8000 'CHECK SCORE
8010 IFT(1)>21 THEN DRAW D$+CD$+BU
$: GOSUB 3500: IFT(2)<21 OR T(2)=21 AN
D E>2 THEN IF E<5 THEN DRAWFI$+CP$+WI
$: GOSUB 3500: IFDD=1 THEN S=S+(B*4)
: GOSUB 5000: GOSUB 9000: PLAYMB$: GOSU
B 3500: COLOR 1: LINE(130, 76)-(255, 8
5), PSET, BF ELSE S=S+(B*2): GOSUB 5000
: PLAYMB$: GOSUB 3500
8015 IFT(1)>21 THEN IF F>1 THEN IFT(3
)<21 OR T(3)=21 AND F>2 THEN DRAWSH$+S
P$+WI$: GOSUB 3500: IFP<5 THEN IFSD=1
THENS=S+(B*4): GOSUB 5000: GOSUB 9000
: PLAYMB$: GOSUB 3500 ELSE S=S+(B*2)
: GOSUB 5000: PLAYMB$: GOSUB 3500
8030 IFT(1)<22 THEN IFT(2)>T(1) THE
NI FT(2)<21 OR T(2)=21 AND E>2 THEN IF E
<5 THEN DRAWFI$+CP$+WI$: GOSUB 3500:
IFDD=1 THEN S=S+(B*4): GOSUB 5000: GO
SUB 9000: PLAYMB$: GOSUB 3500: COLOR 1
: LINE(130, 76)-(255, 85), PSET, BF E
LSE S=S+(B*2): GOSUB 5000: PLAYMB$: G
OSUB 3500
8040 IFT(1)<22 THEN IFT(3)>T(1) THE
NI FT(3)<21 OR T(3)=21 AND F>2 THEN IF F
<5 THEN DRAWSH$+SP$+WI$: GOSUB 3500:
IFSD=1 THEN S=S+(B*4): GOSUB 5000: GO
SUB 9000: PLAYMB$: GOSUB 3500 ELSE S=
S+(B*2): GOSUB 5000: PLAYMB$: GOSUB 35
00
8050 IFT(2)=T(1) THEN IF E<5 THEN IFT
(2)=21 AND E>2 OR T(2)<21 THEN DRAWFI$
+CP$+PU$: IFDD=1 THEN S=S+(B*2): GOS
UB 5000: SOUND 80, 3: GOSUB 3500 ELSE S=
S+B: GOSUB 5000: SOUND 80, 3: GOSUB 3500
8060 IFT(3)=T(1) THEN IF F<5 THEN IFT
(3)=21 AND F>2 OR T(3)<21 THEN DRAWSH$
+SP$+PU$: IFSD=1 THEN S=S+(B*2): GOS
UB 5000: SOUND 80, 3: GOSUB 3500 ELSE S=
S+B: GOSUB 5000: SOUND 80, 3: GOSUB 3500
8070 IFT(1)<22 AND T(2)<T(1) AND E<5
THEN DRAWFI$+CP$+LO$: GOSUB 3500: SO
UND 50, 4
8080 IFT(1)<22 AND T(3)<T(1) AND F<5
AND F>0 THEN DRAWSH$+SP$+LO$: GOSUB 3
500: SOUND 50, 4
8090 FORX=1 TO 500: NEXT: GOTO 150
8500 'FLIP CARD
8510 CARD=DC: SUIT=DS: GOSUB 1500: G
OSUB 3500: RETURN
9000 'DRAW DOUBLE
9010 COLOR 1: LINE(130, 76)-(255, 85)
, PSET, BF: DRAW"BM132,73C3"+DU$+M
$+D$(0)+M$+U$+M$+B$+M$+L$+M$+E$:
GOSUB 3500: RETURN
9200 'DRAW SPLIT
9210 DRAW"BM132,73C3"+S$+M$+P$+M
$+L$+M$+I$+M$+T$: RETURN
10000 'STRING$ DATA ETC.
10010 C$(1)="C4": C$(2)="C4": C$(3)
)="C3": C$(4)="C3"
10020 D$(1)="BM+5,12U4NR6U4E1R5F
1D8BM-8,3" 'ACE
10030 D$(2)="BM+5,5U1E1R5F1D2G1L
1G1L1G1L1G1D2R7BM-8,3" 'DUCE
10040 D$(3)="BM+5,5U1E1R5F1D2G1N
L3F1D3G1L5H1U1BM-1,5" 'TRAY
10050 D$(4)="BM+5,3D5R5NU5NR2D4N
R2L2BM-4,3" 'FOUR
10060 D$(5)="BM+5,3NR8D4R6F1D3G1
L5H1U1BM-1,5" 'FIVE
10070 D$(6)="BM+12,5U1H1L5G1D7F1
R5E1U3H1L5BM-2,8" 'SIX
10080 D$(7)="BM+5,5U2R7D3G6BM-2,
3" 'SEVEN
10090 D$(8)="BM+6,3R5F1D2G1NL5F1
D3G1L5H1U3BU2B1-1,11" 'EIGHT
10100 D$(9)="BM+5,10D1F1R5E1U7H1
L5G1D3F1R5BM-7,7" 'NINE
10110 D$(10)="BM+5,3D9BR5R1E1U7H

```

Listing continued



[illegible]

## Mindbusters

```

120 CLS Ø: P=1Ø24 ' FOR MC-1Ø MA
KE IT: 120 P=16384
130 G=2Ø7: Q=143: U$=CHR$(94): D
$=CHR$(1Ø): L$=CHR$(8): R$=CHR$(
9)
140 FOR X=Ø TO 31: POKE P+X,G: P
OKE 48Ø+P+X,G: NEXT X
150 FOR Y=Ø TO 48Ø STEP 32: POKE
P+Y,G: POKE 31+P+Y,G: NEXT Y
160 FOR X=299 TO 3Ø3: GOSUB 32Ø:
NEXT X
170 PRINT @ 3Ø1,"1": Q=Q+16: FO
R X=74 TO 78: GOSUB 32Ø: NEXT X
180 PRINT @ 3Ø8,"2": Q=Q+16: FO
R X=417 TO 421: GOSUB 32Ø: NEXT
X
190 PRINT @ 419,"3": Q=Q+16: FO
R X=68 TO 72: GOSUB 32Ø: NEXT X
200 PRINT @ 1Ø2,"4": Q=Q+16: FO
R X=181 TO 185: GOSUB 32Ø: NEXT
X
210 PRINT @ 215,"5": Q=143: FOR
X=318 TO 446 STEP 32: POKE P+X,
Q: Q=Q+16: NEXT X
220 N=113: Q=143: FOR X=318 TO 4
46 STEP 32: Z=X+P
230 Z$=INKEY$: POKE Z,255: FOR T
=1 TO 5: NEXT T: POKE Z,Q
240 IF Z$=U$ AND PEEK(Z-32)=128
THEN Z=Z-32
250 IF Z$=D$ AND PEEK(Z+32)=128
THEN Z=Z+32
260 IF Z$=L$ AND PEEK(Z-1)=128 T
HEN Z=Z-1

```

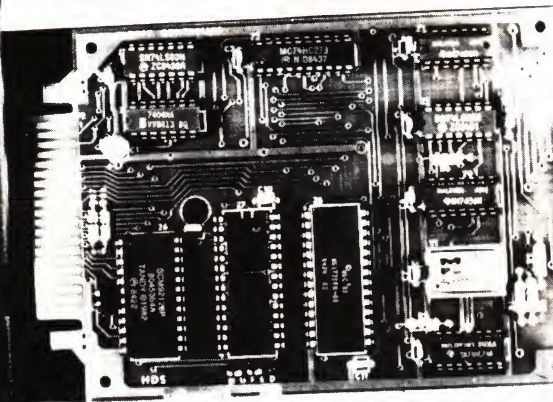
```

280 GOTO 190
290 ON QW GOSUB 330,350,380,400,
420
300 V$="": S$="": PRINT @ H,B$;:
H=326: PRINT @ H,G$;: NEXT QW
310 PRINT @ 384, "FIRST LETTER OF
EACH FORMS"
320 PRINT "ANAGRAM OF RELATED WO
RD.": END
330 X$=MID$(V$,11,1)+MID$(V$,3,1
)+MID$(V$,21,1)+MID$(V$,24,1)+MI
D$(V$,14,1)+MID$(V$,24,1)
340 PRINT @ 20,QW"- ": GOSUB 44
0: RETURN
350 X$=MID$(V$,21,1)+MID$(V$,29,
1)+MID$(V$,21,1)+MID$(V$,1,1)+MI
D$(V$,17,1)+MID$(V$,4,1)+MID$(V$,
17,1)+MID$(V$,6,1)
360 PRINT @ 52,QW"- ": GOSUB 44
0: RETURN
370 GOSUB 440: RETURN
380 X$=MID$(V$,17,1)+MID$(V$,9,1
)+MID$(V$,3,1)+MID$(V$,17,1)+MID
$(V$,15,1)+MID$(V$,7,1)+MID$(V$,
17,1)+MID$(V$,9,1)
390 PRINT @ 84,QW"- ": GOSUB 44
0: RETURN
400 X$=MID$(V$,6,1)+MID$(V$,2,1)
+MID$(V$,6,1)+MID$(V$,26,1)+MID$(
V$,30,1)+MID$(V$,6,1)
410 PRINT @ 116,QW"- ": GOSUB 4
40: RETURN
420 X$=MID$(V$,36,1)+MID$(V$,26,
1)+MID$(V$,26,1)+MID$(V$,5,1)+MI
D$(V$,30,1)+MID$(V$,11,1)
430 PRINT @ 148,QW"- ": GOSUB 4
40: RETURN
440 FOR U=1 TO LEN(X$)-1 STEP 2:
PRINT CHR$(VAL(MID$(X$,U,2))):
NEXT: RETURN
450 END
END

```



## 2nd Generation !!!!! HDS Floppy Drive Controller Board



AS SEEN AT THE RADIO SHACK  
COMPUTER SHOWCASES

### Features\*

- \* Gold Plated Edge Cards
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Reduce your I-O errors with the Hard Drive Specialist Floppy Drive Controller for the Color Computer. Gold Edge Card Connectors, Advanced Design, and the absence of potentiometers make this the best board available to date.

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### NEW ROM

HDS has licensed the ROM from Radio Shack to be able to offer alternative operating systems pre-blown ready for installation. The first of what we hope to be a wide range of options is ADOS. ADOS is a product of SpectroSystems of Miami Florida and is fully supported by the author. The HDS version of ADOS supports 2 drives, 40 track, 6ms trk-to-trk drives only, either Single Sided or Double Sided. The ADOS package comes complete with original documentation and diskette from SpectroSystems and can be installed in our Drive Controller Board at purchase time for no additional charge.

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(useable in the HDS 2nd generation board only)



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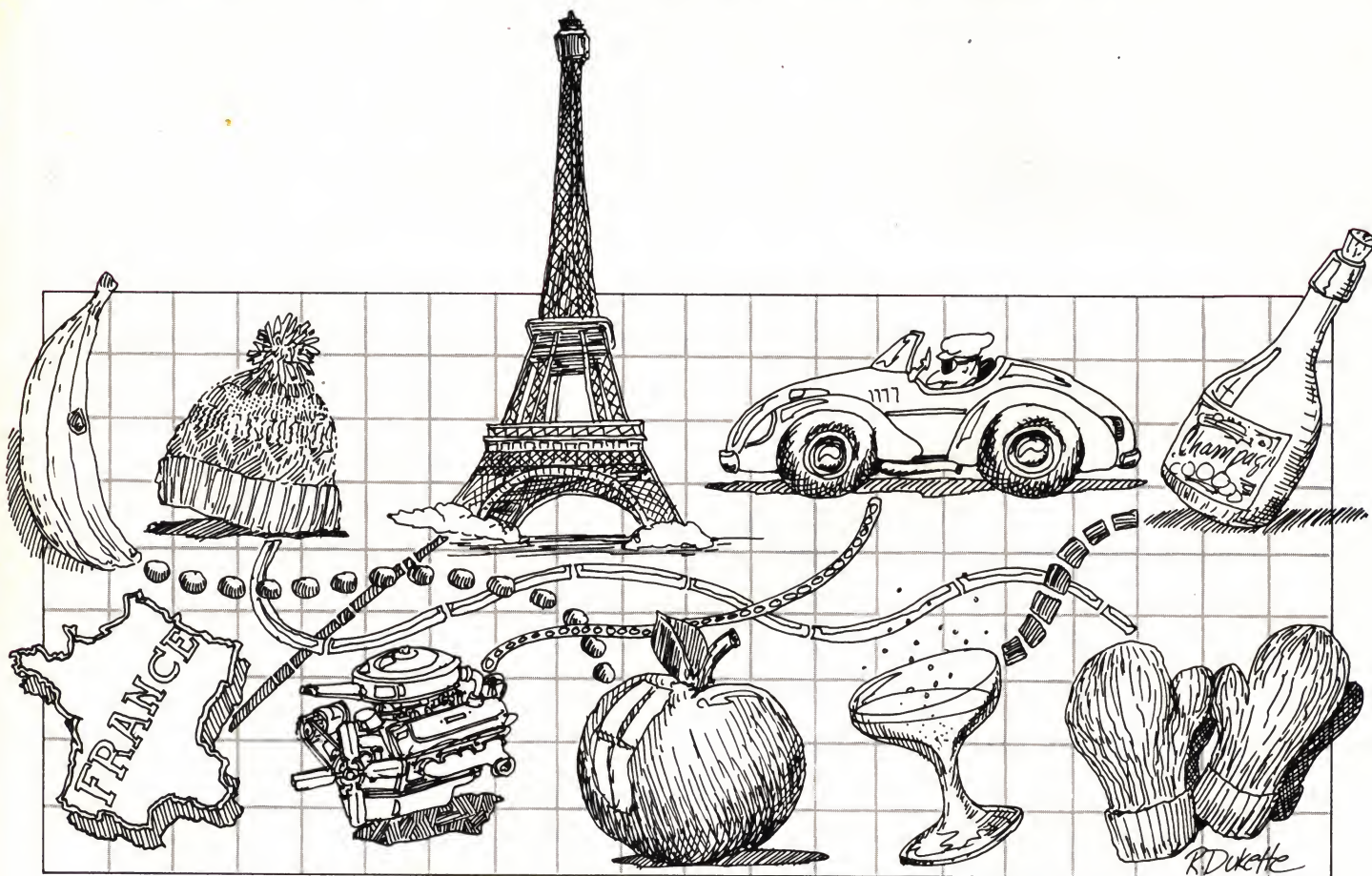
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# Match and Learn



*Your whole family can have fun matching related word pairs.*

**M**atch and Learn presents two lists of items and requires you to match them. You can select items in the list from whatever field of study or interest and change them from session to session by small modifications in the program's DATA statements.

The instructions appear when you run the program. You will see two columns of words. An arrow points to the words in the left column in succession, and you match the indicated word with one on the right by moving

the cursor to the correct answer and pressing the @ key.

The program tells you your score after each session and asks if you want to play again, see the correct answers, or end the session. If you press an incorrect key to this prompt, the program clears the screen and displays the menu.

## For MC-10 Users

You must have the 16K memory expansion to use Match and Learn on an MC-10. You must also make the following change in line 545 for MC-10 compatibility.

545 FOR PK = 16946 TO 16952:POKEPK,  
255:NEXT

## Changing the DATA Statements

Lines 640-999 contain DATA statements that make up the word lists. To create your own lists, replace the words in the DATA statements with your own. For example, if you want to use pairs a A, b B, c C, and d D in line 900, you would type:

900 a,A,b,B,c,C,d,D.

Be sure you have the same number of pairs as in the original program. ■

See program listing on page 46.

Address correspondence to Kenneth K. Raymond, 56 Lynnwood Drive, Rochester, NY 14618.

**System Requirements**  
**Color Computer or MC-10**  
**16K RAM**  
**Color or Micro Color Basic**



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**Sound Commands:** PLAY, SOUND

**String Functions:** CHR\$, LEFT\$, MID\$, RIGHT\$, LEN, INSTR, LSET, RSET, TRIM\$, STR\$, STRING\$, INKEY\$, MKNS

**Numeric Functions:** ABS, POS, TIMER, RND, ASC, TAB, CAL, JOYSTK, PEEK, POKE, LOC, LOF, EOF, FREE, CVN, ERR, VARPTR, SWAP

**I/O Commands:** OPEN, CLOSE, INPUT, LINEINPUT, PRINT WRITE, PRINT @, GET, PUT, KILL, CHAINM, FIELD, DATA, READ, RESTORE

**Program Control:** FOR/NEXT/STEP, GOTO/GOSUB, IF/THEN/ELSE, RETURN, STOP, RETI, ON n GOTO/GOSUB, ON ERROR, ON RESET, ON IRQ/FIRQ/NMI, ON OVR/NOVR, EXEC, LET

**Directives:** ORG, REM OR', END, DIM, END, BASE, RAM, ON/OFF, RAM64K, HIRES, GENERATE, DPSET, STACK

**Editor Commands:** LINE EDIT, AUTO EDIT, COPY, MOVE, RENUMBER, AUTO LINE#, PRINTER, LIST, DELETE, SEARCH, REPLACE, BAUD RATE, PRINTER, CBASIC, APPEND, SKIP, SIZE, LOAD, SAVE, APPEND, KILL, DIR, and much, much more.

REQUIRES 32K and Disk, 64K recommended

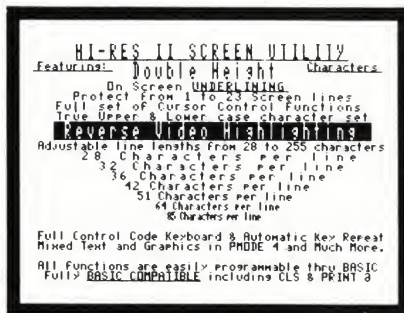
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PROGRAM FEATURES	Screen Enhancement Program Comparison Chart		
	HI-RES II NEW	HI-RES I OLD	BRAND X
Upper/Lower case characters	Yes	Yes	Yes
Mixed Text and Graphics	Yes	Yes	Yes
Separate Text & Graphics	Yes	Yes	No
Print @ fully implemented	Yes	Yes	Only
Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Black	Buff/Black	Buff/Black
X,Y Coordinate Cursor	Positioning	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous	Highlighting	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16 32 & 64K Supported	Yes	Yes	Yes
Green or Black Background	Color	Yes	No
Dual Character sets for Enhanced 64 and 85	Yes	No	No
Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatibility	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
RAM Required in addition to Screen RAM	2K	2K	2K
Program Price (Tape)	\$24.95	\$19.95	\$29.95



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# ***Closed For Inventory***

***Run a small shop or mail-order business? Let your CoCo keep track of your stock.***

**A**ny small businessman knows what a problem inventory management can be. Programs that eliminate this headache are often difficult to learn and use. However, Inventory is easy to use and modify and is flexible enough for most systems.

Inventory is a stock-processing program that allows you to create, modify, save, load, or print your inventory information in groups of 220 items (110 with 16K). The program saves inventory data for each item, as a record in a disk file. Each file accommodates up to 220 items. The standard disk holds a minimum of 11 files of 220 items (records) each for 32K or 22 files of 110 items each for 16K, a total of 2,400 items.

You can print one or all of the files in any of four different formats with the print option. The formats are: Stock Report, Stock and Back-Order Report, Back-Order Report, and Description and Price Report.

The Program Listing is written for a 32K system. Users with 16K systems should change line 10 to CLEAR2300 and change 220 to 110 in lines 14, 70, 72, and 74. After loading, you'll see the question, "Is this a new inventory?" A negative answer brings up the main menu, allowing existing file processing. A positive yes answer proceeds to establish a new inventory.

## **New Inventory**

To set up a new inventory file, you answer the following questions for each item.

---

**System Requirements**  
**32K RAM (16K with changes)**  
**1 Disk Drive**  
**Printer optional**





### ● Row Number?

This is automatically assigned for file reference and is the number you use whenever you want to locate this item.

### ● Item Number?

This is any number (four digits maximum) for your stock reference. As each file uses the same row number (1-220), you may want to create unique numbers for the reports (for example, file 1, items 1-220, file 2, items 221-440). You may want to use the item number for a row/bin location. In any case, it isn't used for computations and can even be left blank.

### ● Description?

Give stock item or comment (20 characters maximum, imbedded commas are not accepted).

### ● Quantity in Stock?

Give number of units presently in stock.

### ● Quantity Purchased?

Give the number of units ordered. The quantity on back order will automatically be calculated. (Qty. on BO = Qty. purchased times Qty. in stock.)

### ● Net Price?

Use your wholesale cost.

### ● List Price?

This is your selling price, retail.

### ● Amount Owed?

If you pay for your stock as you receive it, then the amount owed is automatically calculated (AO = Qty. on BO times net price). Hence, press the enter key because no entry is required. If the amount owed is not paid for as received, then enter the correct amount. This amount overrides the calculated value on all screen displays and on the Stock and Back-Order Report. For your reference, an M (for manual, as opposed to calculated) is appended to the amount owed on the Stock and Back-Order report. The Back-Order report will show the calculated value. If, at a later date, you decide to convert to calculated values, enter the computed values and during update, will they be calculated for all future updates.

To quit and return to the main menu at this point, press the 1 key. Any other key lets you continue to add stock items.

## Stock Processing Options

The main menu is where you can save

### STOCK & BACK ORDER REPORT # 0

ROW NO.	ITEM NO.	DESCRIPTION	IN STOCK	NET EACH	TOTAL STOCK NET	SUGGESTED LIST	QTY ON B.O.	B.O. AMT TOTAL
1	1	FLOPPY DISK DRIVE	3	303.44	910	449.99	1	303.00
2	102	DISKS (GRADE F)	122	2.01	245	2.77	78	156.00
3	3	DISKS (GRADE E)	12	3.33	40	4.49	13	43.00
4	0	DISKS (GRADE FF)	300	2.59	777	3.33	200	124.99M
5	5	PRINTER (EKKER MG66)	2	399.00	796	499.99	1	0.00M
6	6	PRINTER (FRT 5000E)	0	229.00	0	349.00	0	0.00

### BACK ORDER REPORT # 1

ROW NO.	ITEM NO.	QTY ON B.O.	NET FOR 1	B.O. NET TOTAL	LIST PRICE
1	1	1	\$303.44	\$303.44	\$449.99
2	102	78	\$2.01	\$156.78	\$2.77
3	3	13	\$3.33	\$43.29	\$4.49
4	0	200			

### STOCK REPORT # 1

ROW NO.	ITEM NO.	QTY IN STOCK	NET PRICE PER ITEM	TOTAL NET STOCK
1	1	3	\$303.44	\$910.32
2	102	122	\$2.01	\$245.22
3	3	12	\$3.33	\$39.96

### DESCRIPTION & PRICE REPORT # 1

ROW NO.	ITEM NO.	DESCRIPTION	NET PRICE PER ITEM	LIST PRICE	PROFIT EACH
1	1	FLOPPY DISK DRIVE	\$303.44	\$449.99	146.55
2	102	DISKS (GRADE F)	\$2.01	\$2.77	0.76
3	3	DISKS (GRADE E)	\$3.33	\$4.49	1.16
4	0	DISKS (GRADE FF)	\$2.59	\$3.33	0.74

Fig. 1. Sample Printout

Report	Using String Line Number	Print Loop Line Number
Stock Report	142	144
Back-Order Report	66	68
Stock and B.O. Report	136	138
Description and Price	148	150

### Variables

A	.....	Row Number	D\$ ( )	.....	Description
S ( )	.....	Item Number	Q	.....	Profit Each
B ( )	.....	Qty. on Back Order	l ( )	.....	Qty. in Stock
P ( )	.....	Net Price	P4	.....	Total Net Stock
P2	.....	Back-Order Net	B ( )	.....	Qty. on Back Order
P3 ( )	.....	List Price	U\$	.....	Manual Suffix

(The ( ) indicate a subscript; other variables are calculated.)

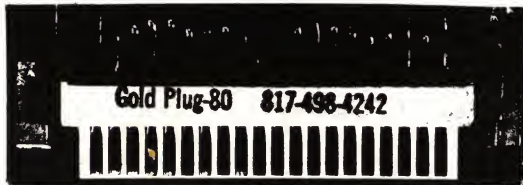
Table 1. Field String and Variable List



TRS-80+ MOD I, III, COCO, TI99/4a  
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your first inventory file. It is the central location for all the stock processing options. The first option is Change Item number. For this, the file must be in memory. You can modify or update your individual items. Don't forget to save the data when you're finished. The second option is Mark for Deletion. Again, the file must be in memory. This allows you to selectively indicate row numbers of stock items that you no longer want to carry on the inventory. The items will not be deleted until you execute the third option, Deletion Process. If you make an error, reload the file and start again. If you've updated the file and you'd prefer not to lose these changes, then use option 6, Save Data, followed by option 7, Load Data. (Deletion marks are not saved.)

The Deletion Process removes all stock items marked for deletion. The items at the end of the inventory replace these items. For example, if you have 108 inventory items and rows 3 and 27 are marked for deletion, row 108 replaces row 3. Row 107 replaces row 27. Now you have 106 inventory items. Remember, the original file is still on disk until you overlay it with option 6, Save. If you accidentally delete part of the inventory by mistake, simply reload the original file.

Option 4, Reports to Printer, does not need to have the files in memory unless you want only one file. This command allows printing in any of four different formats. (See Fig. 1.) Printing a file other than the one in memory causes the file in memory to be destroyed. Add New Item, option 5, adds additional stock items to an existing file. The first available row number is displayed for your reference.

Save Data, option 6, saves the file in memory to disk. The file names must be numeric if you plan to use prints of multiple files later. You are given the existing file number when you initiate Save Data so you'll know which file to overlay with the updated version. Option 7, Load Data, loads an existing file.

List Disk Files, option 8, displays a disk directory. It is written in Extended Color Basic to make modifications easy. The report headings are controlled with PRINT USING statements. To delete a category from one of the reports, replace the field string with spaces and then delete the variable from the print loop. (See Table 1.) ■

See program listing on page 48.

Address correspondence to Robert Eisman,  
68 Kelly Road, South Windsor, CT 06074.



## GAME

by Michael J. Mefford

# Five Card CoCo



*Polish your blackjack game by playing  
against your Color Computer.*

**W**hether you want to bone up on your blackjack game, or just want to pit your wits against the computer, you'll like this card game in high-resolution color graphics. The object of blackjack is to get a count of 21, (or as near to 21 as possible) without going over 21, counting any ace as 1 or 11 (as you choose), any face card as 10, and any other card at its value.

If your first two cards are an ace and a face card or 10, giving you a count of 21 in two cards, then you have a natural or blackjack. If you have a natural (or blackjack) and the dealer does not, the dealer immediately pays off 1½ times the amount of your bet. If the dealer has a natural, he immediately collects your bet.

If both dealer and you have a natural, then it's a stand off or push, and you keep your bet. With the first two cards of the same denomination you can split the pair—that is, treat them as two separate hands, considering you can place an equal bet on the second card. If your first two cards add up to 10 or

11, then you can double down, that is, double your bet and receive just one more card.

If you hit and receive up to five cards and your total is 21 or less, you win and the dealer pays off immediately, twice the bet. The dealer has to hit 16 and stand on 17 or more. If his total is 17 counting an ace as one, then he has a soft 17 and must hit again.

### Running Blackjack

Type in all REM statements that immediately follow a line number. These line numbers are referred to in GOSUB commands. You can eliminate all other REM statements. Type "RUN" and press the enter key. The Color Computer has an inherent PCLEAR problem. If the program does not run the first time, type "RUN" and press enter again.

This apparently allots the appropriate space for graphics and strings.

After you enter your name, the Blackjack logo and \$20 score appears in the right corner of the screen. At this time, place your bet by pressing B to bet a dollar, 5 to bet \$5, and T to bet \$10. Remember, you must be able to cover your bet with your present score (i.e., you've got to have enough money to bet). No card will be dealt without a bet.

Next, press the D key to deal the cards. Your cards appear in the lower left corner and the dealer's in the upper left corner. At this time choose to split if you have a pair (P key), double if you have 10 or 11 (D key), hit if you want another card (H key), or stand if you do not (S key). Press the Q instead of the B if you want to quit. ■

*See program listing on page 50.*

**System Requirements**  
**32K RAM**  
**Extended Color Basic**

*Address correspondence to Michael J. Mefford, P.O. Box 351, Gleneden Beach, OR 97388.*



# Faster Number Cruncher

*Learn how to use Basic's built-in number-crunching routines on both the Color Computer and the MC-10.*

If you write long, number-related programs, you can speed up number crunching by an order of 100 to 1 when machine-language (accessing Basic's floating-point routines) replaces Basic for calculations.

## Floating-Point Representation

To use Basic's floating-point routines in your number-crunching, machine-language calculations, you do not need to know anything about the way numbers are represented in the floating-point number system. However, being familiar with the floating-point number representation helps you use floating-point arithmetic.

This example shows how to convert a decimal number to a floating-point representation. Consider the decimal number 69.375.

1. Convert the integer part of the given number to its binary representation:

$$69 = 1 \cdot 2^6 + 0 \cdot 2^5 + 0 \cdot 2^4 + 0 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0$$

That is, the binary representation of 69 is 1000101.

2. In hexadecimal add 80 to the number of binary digits in 1):  $80 + 7 = 87$ . This is the exponent of the floating-point representation of the given number.

3. Convert the fraction part of the given number to binary:

$$.375 = 0 \cdot 2^{-1} + 1 \cdot 2^{-2} + 1 \cdot 2^{-3}$$

That is, the binary representation of .375 is .011.

4. Combine the binary representations associated with 1 and 3: 1000101.011.

5. Remove the binary point and append zeros to the right of the binary number to yield a total of 32 binary digits:

10001010110000000000000000000000.

6. Convert the binary number of 5 into 4 hexadecimal bytes: 8A C0 00 00. These 4 bytes form the mantissa of the floating-point representation of the given number.

7. The sign of the floating-point number is conveyed in the first mantissa byte. This byte is 0-7F for positive numbers or 80-FF for negative numbers. Since the given number, 69.375, is positive, subtract 80 from the first mantissa byte:  $8A - 80 = 0A$ .

**System Requirements**  
**Color Computer or MC-10**  
**Color Basic or**  
**Micro Color Basic**

```
10 CLS
20 A=69.375
30 FOR I=0 TO 4:PRINT HEX$(PEEK(VARP
TR(A)+I)):NEXT
```

Program Listing 1. Decimal-to-Floating-Point Conversion, Color Computer

```
10 CLS
20 A=69.375
30 Y=VARPTR(A)
40 FOR I=0 TO 4:Z=PEEK(Y+I)
50 B=INT(Z/16)
60 C=Z-16*B+48:B=B+48
70 IF B>57 THEN B=B+7
80 IF C>57 THEN C=C+7
90 PRINT CHR$(B);CHR$(C):NEXT
```

Program Listing 2. Decimal-to-Floating-Point Conversion, MC-10

Hence, the floating-point representation of 69.375 is 87 0A C0 00 00.

It is easier to convert decimal numbers to their floating-point representations by means of a short Basic program. Program Listings 1 and 2 convert 69.375 to its floating-point equivalent.

By changing line 20 of Listing 1 or 2 you can use the associated program to determine the floating-point representation of any decimal number.



## Floating-Point Accumulators

In the RAM areas reserved for the system use of the Color Computer and MC-10 are sets of bytes employed as floating-point accumulators. Both the CoCo and the MC-10 have two such accumulators, called FPAC1 and FPAC2, consisting of 6 bytes: an exponent byte then 4 mantissa bytes, and a separate sign byte. Use of 6 bytes, instead of 5 in each accumulator promotes faster arithmetic calculation. Except for the accumulators, 5 bytes are used for floating-point representations to reduce memory consumption.

In the Color Computer the exponent, mantissa, and sign of FPAC1 are located at addresses 004F, 0050-0053, and 0054, respectively. The corresponding CoCo addresses of FPAC2 are 005C, 005D-0060, and 0061, respectively. In the MC-10 the FPAC1 addresses are as follows: 00C9, 00CA-00CD, and 00CE. The MC-10 addresses of FPAC2 are 00D6, 00D7-00DA, and 00DB.

When processing Basic functions having numerical arguments, the Basic interpreter

```
10 CLS:Q=12288:DEFUSR=Q
20 POKEQ,&H7E:POKEQ+1,&HBF:POKEQ
+2,&H78
30 A=52.9733
40 PRINTUSR(A)
50 PRINTSIN(A)
```

Program Listing 3. SIN Simulation Via USR, Color Computer

```
10 CLS:Y=73:Z=0:POKE16918,Y:POKE
16919,Z:Q=256*Y+Z
20 POKEQ,126:POKEQ+1,246:POKEQ+2
,140
30 A=52.9733
40 PRINT USR(A)
50 PRINT SIN(A)
```

Program Listing 4. SIN Simulation Via USR, MC-10

converts the argument to floating-point and stores it at FPAC1 before performing the given function. The final result of the performed function is also stored in FPAC1. FPAC2 acts in an ancillary manner in the performance of most of the functions.

The USR function can perform any one of these Basic functions with a one-instruction machine-language routine. That instruction

is a JMP to the entry address of the ROM routine associated with the Basic function. After the argument of the USR function is converted to floating-point and stored in FPAC1, Basic relinquishes control to USR's machine-language routine. This routine, via the JMP instruction, performs the Basic function of the argument, puts the result in FPAC1 and returns the result to Basic. Control returns to Basic when the final RTS instruction of the Basic function routine is executed.

Program Listings 3 and 4 show how the USR function can simulate the SIN function.

In each of these listings, Q is the entry address to the USR routine. In line 20 of the Listings the values POKEd into Q + 1 and Q + 2 are the most significant bytes, respectively, of the entry address to the SIN routine in ROM.

The value POKEd into Q is the operation code for the JMP instruction of the 6809E and 6803 chips of the CoCo and MC-10, respectively. Lines 40 and 50 display on the screen the results of evaluating USR(A) and SIN(A), respectively. By changing line 30 you can verify that lines 40 and 50 yield identical results for any values of A you choose.

Tables 1 and 2 show the hexadecimal entry addresses of the routines for the germane Basic functions having numerical arguments.

By making minor changes in Listings 3 and 4 you can simulate other Basic functions. For instance, replace line 50 of each listing with 50 PRINTLOG(A). Change line 20 of Listings 3 and 4, respectively, to:

```
20 POKEQ,&H7E:POKEQ+1,&H84:
POKEQ+2,&H46
20 POKEQ,126:POKEQ+1,240:POKEQ
+2,185
```

## The Floating-Point +, -, \*, and / Routines

Listings 3 and 4 demonstrate that in your number-crunching, machine-language programs you must first store the argument of the desired function in FPAC1 and then jump to the ROM routine to execute that function. In the machine-language program you would use a JSR instruction instead of JMP unless you wanted to return control to Basic at the conclusion of the function execution.

Routine	Entry Address
SGN	BC7A
INT	BCEE
ABS	BC93
SIN	BF78
ATN	83B0
COS	8378
TAN	8381
EXP	84F2
FIX	8524
LOG	8446
SQR	8480

Table 1. Hexadecimal Entry Addresses for Basic Functions with Numerical Arguments, Color Computer

Routine	Entry Address
SGN	F2BA
INT	F335
ABS	F2D5
SQR	F54D
LOG	F0B9
EXP	F5C9
SIN	F68C
COS	F686
TAN	F6D2

Table 2. Hexadecimal Entry Addresses for Basic Functions with Numerical Arguments, MC-10

The next thing that you need to know is how, during the execution of a machine-language program, you go about storing an argument in the FPAC1 before executing the function in a slightly roundabout way: First FPAC1 is cleared to zero and then the argument is added to FPAC1.

In the ROMs of both the Color Computer and MC-10 are routines that do the floating-point arithmetic operations:

1. FPAC1 = [X] + FPAC1
2. FPAC1 = [X] - FPAC1
3. FPAC1 = [X] \* FPAC1
4. FPAC1 = [X] / FPAC1

[X] stands for the floating-point number whose representation is stored at five consecutive addresses starting at the address in the X register of the 6809E or 6803 chip. X points



to the exponent byte of the number; the next 4 bytes are the mantissa of the number.

Tables 3 and 4 show the entry addresses to +, -, \*, and / routines.

Listings 5 and 6 include a short machine-language routine that stores a floating-point number in FPAC1. Initially, in each machine-language routine FPAC1 holds the floating-point representation of the argument of the USR function, which in this case was arbitrarily taken as -27.9. Then the routine stores the floating-point representation of 69.375 in FPAC1 and returns control to Basic.

Routine	Entry Address
+	B9C2
-	B9B9
*	BACA
/	BB8F

Table 3. Entry Addresses for +, -, \*, and / Routines, Color Computer

	Entry Address
+	EF7D
-	EF72
*	FOEF
/	F1C6

Table 4. Entry Addresses for +, -, \*, and / Routines

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In Listings 5 and 6 each of the lines 40, 50, and 60 contains bytes comprising a machine-language instruction. Line 70 contains the 5 bytes of the floating-point representation of 69.375. In Listing 5, the DATA values are in hexadecimal, whereas they are in decimal in Listing 6. The instruction associated with line 40 sets the X register to the address of the exponent byte of the floating-point representation of 69.375.

The instruction corresponding to line 50 sets the exponent byte of FPAC1 to zero, which in turn makes FPAC1 assume the value zero. The instruction associated with line 60 is a JMP to the floating-point add routine. The fact that upon completion of the machine-language routine the number 69.375 is printed on the screen verifies that the routine is executed as stated.

```
10 CLS:Q=12288:DEFUSR=Q
20 FORI=Q TO Q+12
30 READA$:A=VAL("&H"+A$):POKEI,A
:NEXT
40 DATA 8E,30,8
50 DATA F,4F
60 DATA 7E,B9,C2
70 DATA 87,A,C0,0,0
80 PRINTUSR(-27.9)
```

Program Listing 5. Routine to Store Floating-Point Numbers in FPAC1, Color Computer

```
10 CLS:Y=73:Z=0:POKE16918,Y:POKE
16919,Z:Q=256*Y+Z
20 FORI=Q TO Q+13
30 READA:POKEI,A:NEXT
40 DATA 206,73,9
50 DATA 127,0,201
60 DATA 126,239,125
70 DATA 135,10,192,0,0
80 PRINTUSR(-27.9)
```

Program Listing 6. Routine to Store Floating-Point Numbers in FPAC1, MC-10

In Listings 5 and 6, change each line 60 to:

```
60 DATA 7E,BB,8F
or
60 DATA 126,241,198
```

respectively. This change replaces the floating-point add routine with the floating-point divide routine. When you run the changed program, you receive a /O error message before the completion of the machine-language program. That is, the machine-language program prematurely relinquishes control to Basic.

It is possible to prevent a return to Basic when an arithmetic error occurs. Both the Color Computer and the MC-10 provide exits from ROM to RAM immediately before execution of Basic's error-processing routine.

The RAM connection for the CoCo is at addresses 018E-0190; in the MC-10 the analogous hexadecimal RAM addresses are 4297-4299.

At either of these two sets of addresses you can place a JMP instruction to your own error-processing routine. The B register of the 6809E or 6803 chip contains the number associated with the particular type error. For instance, B contains hexadecimal 14 when a divide-by-zero error occurs. If your routine determines that the error was a nonarithmetic type, it can, by executing an RTS, allow the continuation of Basic's error processing.

By replacing the instruction associated with line 50 with NOPs, Listings 5 and 6 demonstrate the floating-point division of 69.375 by -27.9. To make the replacement, change line 50 of Listings 5 and 6, respectively, to:

```
50 DATA 18,18
and
50 DATA 1,1,1
```

## Other Floating-Point Routines

In your number-crunching, machine-language programs you need to get intermediate results from FPAC1 and put them in your program memory area. There is a routine in the Basic ROM that makes such a transfer. You must first set X to the initial address (the one that is to contain the exponent) of the 5-byte location at which you want to store the floating-point number. After setting X, use a JSR with entry address BC35 or F272 for the Color Computer or MC-10, respectively.

Two other ROM routines are often useful in number related machine-language calculations:

1. A routine to obtain the contents of FPAC1, convert it to a 16-bit two's complement integer, and store it in the D register of the 6809E or 6803 chip.
2. A routine to convert a 16-bit, two's complement integer in D into floating-point form and store it in FPAC1.

The Color Computer entry addresses to routines 1 and 2 are B3ED and B4F4, respectively. Similarly, the MC-10 entry addresses to routines 1 and 2 are EB4A and ECE3, respectively.

Armed with this information you have the means to write programs that perform fast and efficient number related machine-language calculations. ■

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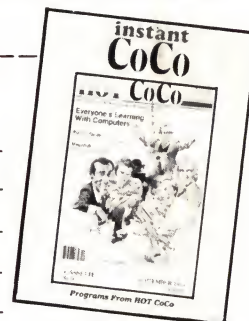
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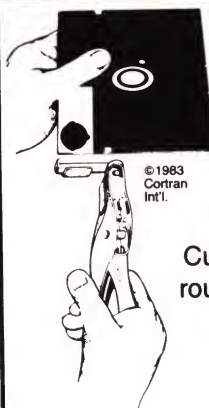
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# ***Spectaculator Golf Handicapping***

***Use your spreadsheet program for more than just budgets.***

**O**ne of the chores I had in mind for my new Color Computer 2 was keeping the handicaps of all the golfers in my league. Existing programs disappointed me, and my own programming efforts didn't do everything I wanted them to.

I did get some good advice from one vendor: Try using a spreadsheet program. I bought Radio Shack's Spectaculator, but the methods discussed here should be applicable to other spreadsheet programs. I recommend a disk-based version, too. Otherwise you may have difficulty with data retrieval. In fact, two disk drives would be ideal; I track 28 golfers and find one drive inadequate.

## **Setting It Up**

My method requires no programming knowledge, only a thorough understanding of Spectaculator. Read your manual thoroughly before you begin. Make a backup of the master disk, and then insert the backup in drive 0 and type RUN"DOS". This gives you a blank format.

Now you must set the number of column headings and the width of each. Spectaculator defaults to seven-character headings—inadequate for this application. Figure 1 shows how I set up the column headings. (Notes in italic are the operations you follow to create the format.)

Figure 1 shows 10 columns of varying widths. You can change this to suit your own desires. The first step is to set the variable VA (used in later calculations to eventually determine the "Total Difference," discussed later on). With the cursor in the upper left of the screen, type AV and press the enter key. Two columns of blanks labeled VA to VV appear.

Type R14C10 (with no commas or spaces)

in the first (left) block, labeled VA. Press the break key and the format reappears. The variable VA is now set. To place the variable in the desired position, set the cursor at the left side of the format at row 17. Type RF, press enter, type VA, and press enter again. VA is now set for all of row 17.

Now put the cursor back to the initial, upper left position. An easy way to do this is to type MM and then press enter twice. Type CW, press enter, type 1,9 (note comma), and then press enter again. This sets column 1 to a nine-character width. Move the cursor to the left side of column 2 and follow the same procedure, but set the width to six characters. Set column 3 to three characters, column 4 to six characters, column 5 to eight characters, column 6 to seven characters, column 7 to nine characters, column 8 to seven characters, column 9 to eight characters, and column 10 to eight characters.

Columns 6 and 8 require no change since they are seven characters, and column 3 will contain no data. It is just a "spacer."

With the column widths set, you must now set the headings. All alphanumeric entries are set in ET mode, so type ET and press enter. Then place the cursor in the upper left, initial position and type a row of equal signs (=) across all of row 1 through column 10. Do the same for row 4. You now have a box in which to place your header.

Position the cursor at row 2, column 1. While still in the ET mode, type "Golfer" and press enter. Then move the cursor down one space and type "Name" and press enter. Fill in columns 2 through 10 according to Fig. 1.

I also entered the data under the headings in columns 4, 6, and 7 using the ET mode. For me, this data remains the same, and

making it a permanent part of the format eliminated the need to enter it each time I use the program. The QH in column 6 stands for Quail Hollow, where we play most of our golf. It is a simple matter to override these entries when entering data.

Press the break key, type EN, and press enter. Now you can enter the numbers used in the calculation. Enter the course ratings in column 7. This number is determined by the USGA for each course. Your club pro will know the rating, and sometimes it is printed on the score card.

To enter the calculation commands, set the cursor to row 1, column 9 and type CF and press enter. Then type C8 - C7 and press enter. This subtracts the course rating from the gross score. The result is the differential, the basis for actual handicap calculation. In row 1, column 10, enter SMT C9. This sums the differentials and gives the "total differential" for a series of games.

Columnar entries are finished—on to row entries. Set the cursor to row 17, column 1 (where you set the calculation variable VA). Type ET and press enter. Then type TOT DIFF: and press enter. The result is that once data is in the file, the value in row 14, column 10 is inserted in row 17, column 2 when you enter the calculate, CA, command.

**System Requirements  
32K RAM**

**Extended Color Basic  
Disk Drive Optional  
Printer Optional  
Spreadsheet Program**



One drawback to this setup is not only did the correct figure appear in row 17, column 2, but also in columns 3, 4, 5, and so on. The solution was to enter a space in ET mode using the spacebar in the cells where I didn't want the data to appear.

Now set the cursor to row 18, column 1. Type RF and press enter. Then type R17/10 and press enter. This equation takes the total differential from row 17, column 2 and averages it for 10 games. Then type ET, press enter, and enter AVE DIFF: in row 18, column 1. Leave column 2 free, but use the spacebar treatment for all other columns in row 18.

Next, set the cursor to row 19, column 1 and type RF and press enter. Then type IR18\*.96 and press enter. This equation takes the value of the average differential in row 18, column 2 and multiplies it by 96 percent, which is the USGA handicap. The I gives you integer values only.

In the ET mode, type HANDICAP and press enter with the cursor in row 19, column 1. Again, use the spacebar to close off all other cells in the row.

All that's left is to save the format. Place the cursor in the initial position, type SA, press enter, type FORMAT, and press enter again.

If you do not have too many golfers, you can probably get away with sorting their data on one disk. I have too many (28), so I save each golfer's data to a data disk in drive 1, assigning each player his own file name, and use drive 0 for the program disk only.

I experienced one idiosyncrasy with Spectaculator. Whenever I tried to load a file from a cold start using the LO command, I got an I/O error. However, when I repeated the command, the file loaded.

## Entering Data

First, you must enter the identifier. Set the cursor to row 5, column 1, and in the ET mode type "name," where the name is the actual file name (I use the players' names for file names) and press enter. Next, move to row 5, column 2 and enter the player's number. (This isn't necessary, but I do it for clarity.) Now move to row 5, column 5 and enter the date in MMDDYY style. Then move the cursor to row 5, column 8, press break, and enter the EN mode.

Type in the gross score for that golfer on that date. Repeat the procedure for the remaining nine games. Now you are ready for the calculations, so press break, type CA, and press enter. Be sure to save the file once the calculations are done.

I use a DMP-120 with its condensed format to print my listings. For future reference, I place a note in rows 17 and 18, columns 6 to 9, stating that the file is saved on disk in drive 1 as file xxxx.

Spectaculator has one shortcoming that other spreadsheet programs might overcome: It cannot sort data. Therefore, it is difficult to keep entries in sequential order.

I will gladly answer any questions you have in regard to this article. Just send a stamped, self-addressed envelope to the address below. ■

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10
Col. Width (CW)	1,9	2,6	3,3	4,6	5,8	6,7	7,9	8,7	9,8	10,8
									C8-C7	SMTC-9
1	----	----	----	----	----	----	----	----	----	----
2	GOLFER	GOLFER		GAME	DATE	COURSE	COURSE	GROSS	DIFFER-	TOTAL
3	NAME	NO.		NO.		PLAYED	RATING	SCORE	ENTIAL	DIFF.
4	----	----		----	----	----	----	----	----	----
5				1		QH	68			
6				2		QH	68			
7				3		QH	68			
8				4		QH	68			
9				5		QH	68			
10				6		QH	68			
11				7		QH	68			
12				8		QH	68			
13				9		QH	68			
14				10		QH	68			
15						QH	68			
16						QH	68			
17	TOT DIFF:									
18	AVE DIFF:									
19	HANDICAP:									
	In Row 17, type RF <enter> then VA <enter> (cursor at beginning of rows)									
	In Row 18, type RF <enter> then R10/10 <enter> (cursor at beginning of rows)									
	In Row 19, type RF <enter> then IR18*.96 <enter> (cursor at beginning of rows)									

Fig. 1. Completed Format

A.J. Sabel is a retired U.S. Army colonel and has been an active amateur radio operator for over 50 years. Address correspondence to him at 27 South Shore Drive, Gulf Harbors, New Port Richey, FL 33552.



# Assembly 101

by James and Victor Perotti

## Getting Started

This is the first in a series of articles introducing Assembly-language programming techniques. We'll try to keep it simple and include lots of examples. The first article will provide background on the 6809 CPU (central processing unit) and describe the Color Computer's configuration.

Most programmers who learn to work in Assembly imagine that someday they will write a program like Lotus 1-2-3 and make \$17 million. Few, if any, of us will ever be proficient Assembly-language programmers, but that's all right—programming itself is rapidly becoming an obsolete skill. Fast Basic, Forth, C, and Pascal compilers now abound. Even though most of the code from higher-level languages is not as efficient or fast as compiled Assembly code, the savings in programming time are enormous. So why learn Assembly?

There is no better way to learn about computers than by learning to program in Assembly. With it you are directly manipulating the CPU; you are writing in the language of the machine; you are learning how the computer works. With other languages, you program in the environment of that particular software. Assembly is the lowest-level language, the one closest to the raw binary code that the CPU really processes.

Assembly-language programs are also very fast; compiled code runs at least 10 times faster than Basic. The speed is extremely important for action games with graphics: The high-resolution screens need to be rewritten unnoticeably, and the joystick movements processed rapidly. You can also write Assembly-language subroutines and call them from Basic, speeding up large, time-consuming tasks.

### A Look at the 6809 CPU

Each CPU has its own unique Assembly language, because each CPU has a different

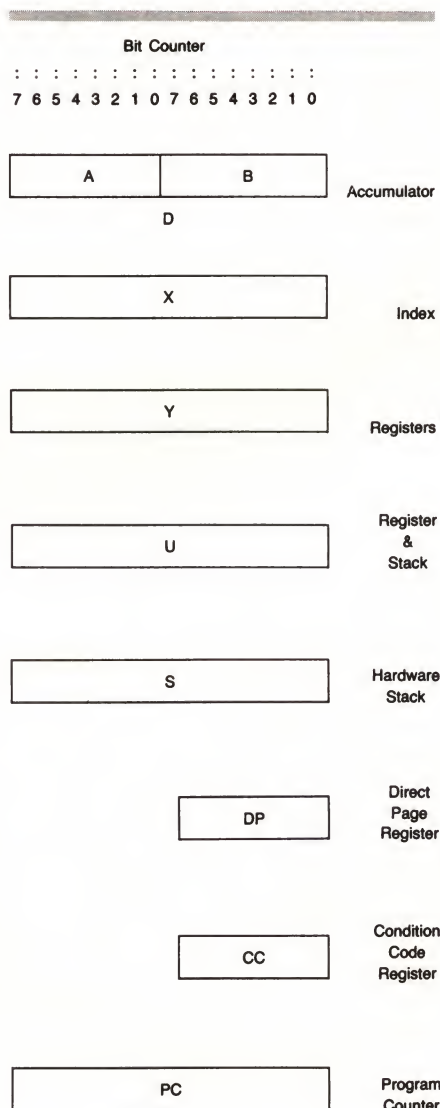


Fig. 1. Register Set for the 6809 CPU

set of instructions microcoded on the CPU chip. Hence, learning 6809 Assembler will not qualify you as an IBM mainframe Assembly-language programmer. Each instruction set is different; 6809 code cannot run on an Apple or an IBM PC. There are, however, families of microprocessors. The two dominant manufacturers of microcomputer CPUs are Motorola, which makes the 6809, and Intel, which makes the 8088/8086. The knowledge gained on the Motorola 6809 will readily transfer to Motorola 68000 series of CPU's. The new 68020 has more power than most minicomputers and will be the chip of choice in the emerging "supermicros."

Don't get the idea that the 6809 is a small-time or obsolete CPU. It is easily the match of the 8088 CPU in the IBM PC. It also has a much nicer instruction set than the 8080, so it is easier to learn and easier to program. Look at Fig. 1, the register set of the 6809.

Note two things about the figure: the number and size of the registers. The size of the registers is expressed in bits (e.g., 8 bits, 16 bits, 32 bits). An 8-bit register (i.e., eight binary digits) can hold addresses (or data) up to 255 decimal, since that is equivalent to 11111111 binary. A 16-bit register packed full of ones holds addresses up to 65535 decimal. The 16-bit register permits the 6809 to load and store data anywhere within its 64K memory with only one address register needed. The 8-bit registers force the programmers to fetch each of the two halves of an address for loading data, each of the two halves of the data, and each of the two halves of the storage address!

More registers provide more places to hold data and addresses. Most of the time three 16-bit registers will suffice: The X register holds the address from which data is loaded, the A/B accumulator holds the data, and the Y register holds the address at which the data is to be stored. As you will see, however, the



S and the U registers are needed for temporary storage. The 6502 CPU used in Apples, Commodores, and Ataris has three 8-bit registers and an 8-bit stack, forcing the programmer to continuously juggle data and addresses.

IBM confused consumers by claiming that its 8088 was a 16-bit processor. Both the 6809 and the 8088 are 16-bit processors in the sense that they employ 16-bit registers. But both have 8-bit RAM and ROM; the 4164 memory chips used in both machines have 8-bit data storage. It takes two fetches from memory to fill the 16-bit registers. A true 16-bit machine, such as the Motorola 68000, has 16-bit (or larger) registers and 16-bit RAM.

## Color Computer Memory Map

When you program in Assembly, you're on your own. You must decide where to locate your program and where to store your data. As you know, the Color Computer's Basic is stored in ROM at the top of memory, and it uses the bottom of RAM for its pointers, the screen, disk buffers, and so on. Table 1 shows the free memory in a memory map.

The table represents the layout of RAM and ROM in a 16K or 32K Color Computer running the Disk Basic Operating System. When a 64K CoCo uses either Flex or OS-9 operating systems, the map above \$8000 has RAM rather than ROM. Both load their operating systems from disk into RAM at \$C000 to \$FFFF. This series of articles will largely ignore this configuration and stick with the plain old Color Computer.

## Why Hexadecimal Numbers?

There's nothing magic about hexadecimal numeric representation. The main reason for its use is that the base-16 number set fits nicely into 8- or 16-bit memory slots, while decimal numbers don't. The largest number

Address	Contents
\$0000	Bottom of RAM, zero page
\$0100	Basic's pointers
\$0400	Top of video screen, VIDRAM
\$0600	End of screen; start of disk stuff
\$0E00	Free RAM; pointer at \$00BC
\$2600	User's Basic program; pointer at \$0019
	User's Basic variables; pointer at \$001B
	User's Basic arrays; pointer at \$001D
	Free memory; pointer at \$001F
	String storage; expanded with CLEAR n
	Storage of machine-language programs; created by CLEAR statement; pointer at \$0027
\$3FFF	Top of RAM for 16K system
\$7FFF	Top of RAM for 32K system
\$8000	ROM begins with Extended Color Basic
\$A000	Basic
\$C000	Disk Basic or ROM packs
\$FF00	Input/Output ports
\$FFFF	Top of ROM/RAM

Table 1. Memory Map of Color Computer with Basic ROM

that an 8-bit memory can hold is \$FF in hex, but 255 in decimal; the largest 16-bit number is \$FFFF, or 65535 in decimal. Hence, when a programmer is scanning the contents of memory, the hexadecimal notation is neatly grouped in rows of two numbers. As you can see above, whoever laid out the computer's memory also worked with hexadecimal addresses.

Don't worry about learning to compute in hex; you won't have to multiply \$BC x \$1FF. You will quickly become comfortable using hex addresses for things and expressing

ASCII codes in hex. It's just not that big a deal.

*TRS-80 Color Computer Assembly-Language Programming*, by William Barden, Jr. Radio Shack, cat. no. 62-2077.

*6809 Assembly-Language Programming*, by Lance Leventhal. Osborne/McGraw-Hill: Berkeley, CA, 1981.

*Programming the 6809*, by Rodnay Zaks and William Labiak. Sybex: Berkeley, CA 1982.

*Assembly-Language Graphics for the TRS-80 Color Computer*, by Don Inman and Kurt Inman. Reston: Reston, VA, 1983.

*An Introduction to Microcomputers* (vols. 0,1) by Adam Osborne. Osborne/McGraw-Hill: Berkeley, CA, 1980.

Table 2. Selected 6809 Assembly-Language Manuals

## Next Time

We will start right off with some small Assembly-language programs next time. If you don't already have an editor/assembler software package, it's time to buy one. Most of the editor/assemblers you see advertised will do the job, but please understand that the Flex and OS-9 assemblers operate in different environments and are not compatible with this column. Disk versions of editor/assemblers are best for our purposes. We will be using Micro Work's Macro-80C disk assembler; we prefer it to all the Color Computer assemblers we have used.

If you stick with this column, you'll become familiar with the reset button behind your computer as your programs crash and lock up your machine. If you're serious about learning Assembly-language programming, you'll find it necessary to do some extra reading. Table 2 lists some of the better books on the subject. ■



get to include one.

CoCo Solver runs on JDOS in addition to Radio Shack DOS—a nice extra. I anticipated problems in loading the machine-language portion of the system with JDOS, but it works perfectly.

## Program Generator

Program Generator is a separate package that creates programs from your CoCo Solver templates. Once you've created a new program, you can give copies of it to your friends without violating copyright laws because the new programs run on their own.

The Program Generator package is remarkably easy to use. It has a machine-language routine it takes from CoCo Solver that creates new code. It also uses the same disk I/O. All you have to do to use Program Generator is run the program and type the name of a CoCo Solver data file. The Generator does the rest. After a short wait the screen clears and a prompt lets you know that your program is ready. When the OK prompt appears you can either run your new program or save it as you do with any Basic program.

Program Generator combines your program statements with the page format that the CoCo Solver uses. This format is a split screen. Each page displays eight user's statements on the top of the screen and eight program prompts at its bottom. The available functions are: move to the previous or following page, enter values, run the resulting answer, vary two variables over a range related to another variable, and erase input. Other options include loading and saving your data, and copying the screen pages to your printer.

## "CoCo Solver and Program Generator are fine programs."

The print routine copies the current page to the printer, excluding the program prompts on the lower section of the screen. It would be better if the program permitted you to input a range of pages for copying. The ability to print one page at a time, however, is satisfactory. Unlike CoCo Solver, Program Generator does not allow you to modify its pages. Its line descriptions are fixed, and it does not display variable names. The only aspects you can change are the numeric values. (You must use CoCo Solver to make any changes to the pages.)

## Error Handling

Program Generator is as well written as CoCo Solver. David Jackson did an excellent job of making the program crashproof—it rejects all invalid entries. Program Generator disables the clear key but does not alter the function of the break key or the reset button. I wasn't able to crash the program from the keyboard.

Data files that you produce with CoCo Solver must be error free or your new Program Generator creation will come to a halt with a

syntax error. Error messages use the same code as those in CoCo Solver—a two-digit number that indicates the screen page and line containing the error. It is easiest to use CoCo Solver to fix errors because of the way that it creates program code, although it is possible for an experienced programmer to patch the code.

## Documentation

The review copy of Program Generator came without documentation. None is needed because CoCo Solver has extensive documentation, and except for its disk I/O, Program Generator is self-prompting. However, the author promises that buyers of Program Generator will receive an instruction sheet with their purchase.

## Summary

CoCo Solver and Program Generator are fine programs. Anyone with knowledge of math or Basic programming can quickly adapt to this method of programming because of its versatility and ease of use. If you are a stranger to programming, the CoCo Solver system and its tutorials (and lots of patience) can get you started in the right direction. Even for the novice, the effort required to learn to use CoCo Solver and Program Generator is well worth the result. ■

*CoCo Solver and Program Generator are manufactured by JTJ Enterprises, 156 Cheek Road, Nashville, TN 37205, 615-356-5796, 615-358-2635. Their disk versions require 32K and their cassette versions require 16K. CoCo Solver sells for \$79.95 and Program Generator sells for \$39.95.*

# Tandy's Touch Pad

by Scott L. Norman

	construction quality	documentation	set up	performance	ease of use
6					
5					
4					
3					
2					
1					
OVERALL RATING 2.50					
Hardware					

The TRS-80 Touch Pad is an alternative input device for Color Computers. It is essentially the same device as the popular Koala Pad marketed by Koala Technologies for other computers. The Touch Pad has a four-inch square pressure-sensitive surface

on which you draw with a stylus (part of the package). It has the same resolution as a joystick on the CoCo—64 spots in either direction. It plugs into the CoCo's right joystick port and can replace the joystick in game, graphics, and menu-selection applications.

The DIN plug on the Touch Pad's connecting cable has a center contact that makes it incompatible with the sockets on older CoCos; it would not plug into my silver-cased E board model. The Touch Pad works fine, however, with CoCo 2's and the newer-model, white-cased Color Computers.

The Touch Pad has two large rectangular "fire" buttons along the top edge of its case, but only the left button is activated. It duplicates the action of the button on a joystick, reducing the contents of memory location



Tandy's Touch Pad



65280 from 255 to 254 when you press it. On the Koala Pad versions for some other computers, both buttons work but seem to do nothing more than accommodate left- and right-handed users. Although this is certainly a worthy function, the buttons are set so close together that the difference is negligible. One central button could easily accommodate everyone.

When you print either "JOYSTK(0)" or "JOYSTK(1)" without exerting pressure on the Touch Pad's surface, a value of 33 returns. The (x,y) coordinates of the upper left and lower right corners are (0,0) and (63,63), respectively.

There is interaction between the drawing area and the pushbutton. When you apply pressure to certain large areas of the Pad, the value in location 65280 drops from 255 to 127; the value drops to 126 if you press the pushbutton at the same time. Take this into account when writing your own drawing programs. The following is a simple drawing program in which you press the pushbutton to clear the screen.

```
10 PMODE 4,1:PCLS:SCREEN 1,1
20 X=JOYSTK(0):Y=JOYSTK(1)
30 PSET (X,Y,3)
40 PB=PEEK(65280)
50 IF PB < >255 AND PB < >127 THEN
10 ELSE 20
```

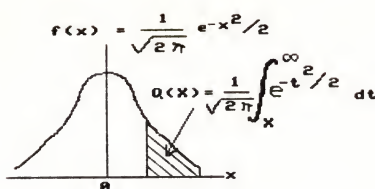


Fig. 1. The TRS-80 Touch Pad by Tandy and Four Star Software's CoCo Paint collaborated on this math curve.

## Performance

In principle, a stylus-and-pad device should be superior to a joystick or mouse for computerized drawing; we are used to drawing with a pen or pencil. In practice, however, the Touch Pad's response is erratic. You must press down firmly to get a clean response with typical graphics programs. I used CoCo Paint, which is a fine program (see the review in the April 1985 issue of *HOT CoCo*, p. 71), with the Touch Pad for this review. But I had to spend a great deal of time cleaning up the extra black dots that the Touch Pad left on my screen (presumably from spurious contact within its conductive membranes).

When you press down hard enough on its touch-sensitive area, the Touch Pad provides clean lines. The chart illustrating a mathe-

matical curve and formulas in Fig 1 shows the results of combining the Touch Pad's sketching ability with CoCo Paint's text and straight lines. Even after practice with the Touch Pad, however, some cleaning up of unwanted dots was necessary. It is also more difficult to draw when you are pressing down hard than when your hand is free to move lightly.

## Summary

The Touch Pad should receive a great deal of credit for its potential as a drawing device, but the manufacturer needs to improve its response. As it stands, it is overpriced. Only the barest of documentation is furnished with the unit. I see little value in the device as a game-playing aid, with rare exception. If used in conjunction with as yet undeveloped software, the Touch Pad could provide a useful menu-selection device for some handicapped people. But at this time, I don't see a useful and trouble-free application for the Touch Pad. ■

*The TRS-80 Touch Pad is manufactured by Tandy Corp., 1400 One Tandy Center, Fort Worth, TX 76102. The Touch Pad is for late-model CoCos or CoCo 2's. It sells for \$49.95.*

# DOS to DOS: ADOS and SpectrumDOS

by R. Stephen Berry

	ease of use	documentation	performance	error handling
6				
5				
4				
3				
2				
1				
<b>OVERALL RATING 3.25</b>				
Application Software				

## SpectrumDOS

	ease of use	documentation	performance	error handling
6				
5				
4				
3				
2				
1				
<b>OVERALL RATING 4.75</b>				
Application Software				

## ADOS

If you want more functions from your DOS (disk operating system) than Disk Extended Color Basic (DECB) provides, one of these new DOSes might be just what you need. ADOS from SpectroSystems and SpectrumDOS from Spectrum Projects offer new features and enhancements of DECB.

Both of these DOSes were designed to be customized to suit your system by "burning" them into a ROM chip. There are several companies that perform this service, usually for less than \$25, or you can buy an EPROM burner and do it yourself. When you substitute the new chip for the original one inside your disk controller, the custom DOS is there whenever you turn on your CoCo—without using any RAM. If you have a 64K CoCo, you can also run these systems from RAM—an advantage for some users.

One application of these new DOSes arises if you use non-Radio Shack disk drives with your CoCo. Radio Shack's DECB runs the CoCo's drives in a 35-track format at a step rate of 30 milliseconds, and their performance is just fine for many people. But if you want 40-track drives or high-speed step

rates, you have to look somewhere else for a drive or drives and a DOS that can give you these features. ADOS and SpectrumDOS let you alter these specifications to fit your equipment and your needs. In my test, the CoCo's standard disk drives performed better with ADOS and SpectrumDOS. They ran at a step rate of 20 milliseconds on factory-prepared programs without I/O (input/output) errors.

## Performance

If you write a fair amount of software in Basic, whether it's for personal use or sale in the marketplace, you need a better editor than the one Radio Shack provides. What editing features are helpful? Here is one example. Picture what might be a familiar editing session. You are formatting the printer output for a new program and you find yourself thinking: "If I have to type PRINT #-2 one more time I'm going to throw this handy white or gray box into a trash compactor." SpectrumDOS lets you define this or any other Basic command with a number key.



ADOS only lets you define function keys when you are customizing the DOS. However, all its letter keys are definable, too, providing a much larger number of programmed functions.

Both DOSes can write line numbers automatically. For example, type AUTO 10,10 and press the enter key. The first 10 is the number of the first line; the second 10 sets the space between line numbers. Another nice feature of SpectrumDOS is autorepeat, which has recently become available in several software packages. In addition, SpectrumDOS offers two work-saving commands—line move and line copy. Suppose you want to move a block of code, such as GOSUB 1000, out of the flow and make it a subroutine. You could retype it, but with SpectrumDOS you can type LMOVE 25,1000. This moves line 25 to line 1000 and deletes the original line 25. Typing LCOPY 25,1000 copies line 25 on line 1000 without deleting it.

SpectrumDOS has a built-in, high-resolution text screen, but this function is lost if the DOS is burned into a ROM chip. ADOS has a high-resolution screen utility that you can use separately, even if ADOS is converted to ROM form. These high-resolution screens are an advantage, but they work best on a monitor.

When you run these DOSes from a disk, they use the "hidden RAM" that resides on the back side of the CoCo's ROM. The cohabitating RAM and ROM let the CoCo accept 64K programs. But many programs don't require the upper 32K of RAM available on a 64K Color Computer. ADOS and SpectrumDOS turn off the Basic ROM by switching to the adjoining or hidden RAM in ROM. One result of this is that 64K programs can interfere with these new DOSes. You can solve the problem by burning the new DOS into a ROM chip and installing it into your disk control-

ler. By doing so, you leave the adjoining RAM open for any 64K programs that might require it.

## How They Stack Up

How do these DOSes compare? Between them they have nearly every feature you might want. ADOS lacks line move, line copy, and repeating keys. And its function keys must be predefined. However, ADOS offers a better COPY command that lets you copy files between drives. It has an outstanding file reader and a mini monitor for studying memory contents. It also has a lower price. ADOS runs smoothly enough to warrant anyone's consideration.

For its part, SpectrumDOS lacks a file reader and monitor, but it provides all the crucial editing features discussed above and more. Its manual states that when you customize SpectrumDOS, you can define the prompt and the cursor character. Messages appear on screen during BACKUP that explain the process—a nice touch. When it is formatted in RAM, it has a help command that gives examples of the syntax of all the new commands.

The EPROM version of an all-purpose DOS is more desirable because it is there whenever you turn on the machine. In order to fully review these DOSes, they were sent to an independent company for programming as a ROM chip. The SpectrumDOS EPROM failed to work when I inserted it into my CoCo. The instructions that come with the package were inadequate for a successful transfer onto an EPROM.

The ADOS burning took place without a hitch. The DOS shines in its EPROM version. Although I found no compatibility problems with other applications, ADOS provides a

command called DISABLE that reverts the DOS back to the Color Computer's Basic. And the SCAN, MON, and PEEP commands are useful programming aids.

Despite the serious problem with burning SpectrumDOS into an EPROM, when implemented in RAM, it is clearly superior as a programming tool. The ability to define a function key for each of several operations as you need them is a real help. And the autorepeat and line-move functions are handy.

## Summary

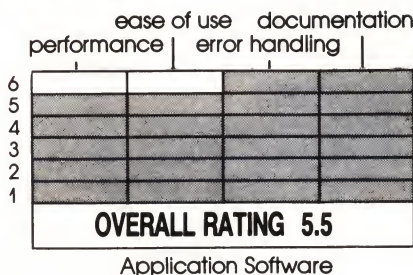
If you do a great deal of software development, I recommend that you consider picking up SpectrumDOS and running it from RAM. Perhaps the company will iron out the documentation problems with burning the program into an EPROM.

Although ADOS is not as useful an editing tool, I won't part with my ADOS EPROM for anything. Whenever I turn on my CoCo, the extra features of ADOS await me. One of its more useful commands is CAT, a compressed form of DIR that increases the number of file names visible at one time. RUNM is another handy feature; it combines LOADM and EXEC into one command. If you want the advantage of a DOS that has several well-planned and convenient features for use with other programs, ADOS is the way to go. ■

*ADOS is manufactured by Spectro-Systems, 11111 North Kendall Drive, Suite A, 108, Miami, FL 33176, 305-274-3899. It sells for \$29.95. SpectrumDOS is marketed by Spectrum Projects, P.O. Box 21272, Woodhaven, NY 11412, 212-441-2807. It sells for \$49.95. Both DOSes require 64K and a disk drive.*

# The Explosive Dynamite +

by Terry Kepner



**H**ave you ever bought a machine-language program and then discovered that you need to move it to a different memory location than the one into which it would

normally load? Maybe you want to fix it so that it can use the special hardware you've attached to your computer. Or perhaps you want to see how the programmer managed to fit such a powerful program into so small a section of RAM.

You need the program's source code to address these tasks. But because the authors of most commercial programs are reluctant to release their source codes to the public, it can be very difficult to do any of these things. What you need is a disassembler—a program that takes apart machine language and generates an Assembly-language source file that you can load into an editor/assembler program for modification. You end up with a file that has all the proper mnemonic codes, without com-

ments or explanations; you have to add those on your own as you explore the program.

## Disassemblers and Dynamite +

There are several kinds of disassemblers. Simple ones just take the execution address of the target program and generate a listing of the appropriate Assembly-language mnemonics. More complex disassemblers offer many options and capabilities designed to substantially reduce the number of hours you spend trying to trace the program's logic flow.

Dynamite + is one of the more complex disassembler programs. It has many powerful features and offers options that any machine-language programmer can appreciate. Dynamite + comes in Color Computer versions for



OS-9 and Flex. (The Flex version, not reviewed here, is more expensive.) It can disassemble the codes of 6809 and 6800 CPUs (central processing units) under Radio Shack DOS or Flex. And the code that Dynamite + produces is completely compatible with the original binary file, as long as you don't modify it too much.

Dynamite + produces labels for memory reference. You define external memory references with EQU (equate) statements, which initialize and label data or addresses. This lets you define blocks of machine language as data that are not to be disassembled as code. Disassemblies can have line or page numbers. Dynamite + also includes special utilities for generating cross-references, converting code formats between Motorola, Radio Shack DOS, and Flex, and saving blocks of memory in any one of these three formats.

Dynamite + is easy to use. You type "Dynamite," the input file name, and any options that you want on the OS-9 shell-command line. You can also specify any of the normal OS-9 shell-command modifiers (data-area resizing and input/output redirection, for example) on the command line. The simplest command is "Dynamite" and the target program's file name.

## Performance

The following are some of the options you can specify with Dynamite + : print the ASCII equivalent of the operand code on the source line; prompt for data-area boundaries; use double ASCII constants; expand the disassembly vertically by adding a blank line before each labeled code line; send the full disassembly to the standard output path; disassemble to disk; disassemble as 6800 code instead of 6809; allow 5-bit offset indexing; use a disk command file for disassembly specifications (you can create a file of the different options and data-area boundaries for a particular disassembly, revise it as needed, and use the file instead of typing the various options each time); control where the disassembly begins in the program (for example, skip the first 10 pages of the disassembly); and set page width and page headings.

Dynamite + has a set of error messages (not just numbers) relating to Dynamite +, OS-9, and Radio Shack DOS. The messages from systems outside of Dynamite + are echoed by the program to the screen. The disassembler detects 17 internal user errors.

Dynamite's real power lies in its command- and label-file features. The command file

makes it possible for you to create a general-purpose file (with comments) for disassembling programs, which helps to tailor the process to your needs. You can also define the kinds of labels you want to use with particular addressing modes. For example, you can set Dynamite + so that a direct-page manipulative code with addresses in the range of \$0000 to \$FFFF displays the operand as a decimal instead of a hexadecimal number. This greatly reduces the keystrokes you need when you are working on a program. As you locate prompts and data areas, you can add their boundary limits to this command file so that subsequent disassemblies will identify them correctly for reassembly.

The label file is similar. You use it to identify labels with their definition addresses; any program reference to these addresses will have the correct label attached in the disassembly. To help you with this, Dynamite + has several predefined label files for the many operating systems with which it is compatible, including OS-9.

## Documentation

Dynamite's documentation is well thought out. It assumes that you are familiar with OS-9

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and machine-language programming. The instructions won't teach the novice to program, but they are clear enough to guide just about anyone through the disassembler's procedures. The manual succinctly defines and explains terms with which you might not be familiar. It even has directions on how to modify the default parameters of the program. All Dynamite + options are available for setting as

automatic defaults. Dynamite + tries hard to be easy to use and helpful to the machine-language programmer with a disassembly chore.

## Summary

About the only things Dynamite + doesn't do is tell you which files to disassemble, identify data areas, and put comments and explanations in the listing for you. If you want a

powerful OS-9 based, machine-language disassembler, you'll find that Dynamite + is the right tool. ■

*Dynamite + is manufactured by Computer Systems Center, 13461 Olive Blvd., Chesterfield, MO 63017, 314-576-4020. It requires 64K, OS-9, and a disk drive. It costs \$59.95.*

## And Now, Word-Pak II

by Terry Kepner

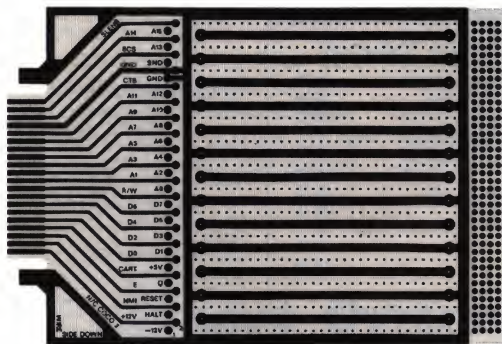
	construction quality	documentation	set up	performance	ease of use
6					
5					
4					
3					
2					
1					
<b>OVERALL RATING 5.5</b>					
Hardware					

**P**BJ has made a great product even better. Word-Pak is a hardware device with special driver software that gives your Color Computer an 80-character by 25-line display on a standard monitor. It provides true upper- and lowercase characters and many graphics characters similar to those on TRS-80 models I, III, and 4. The software supplied with the package offers many of the features you need to make the CoCo work as

a "dumb" terminal. These include the 80-column by 24-line display, on-screen editing, and x-y character positioning. Word-Pak's software is also "invisible" to the user; once it is initialized you don't notice it. (For more information on the first version of Word-Pak, see the review on p. 96 of the July 1984 issue of *HOT CoCo*.)

The latest version of this product is called Word-Pak II. It adds two control codes that

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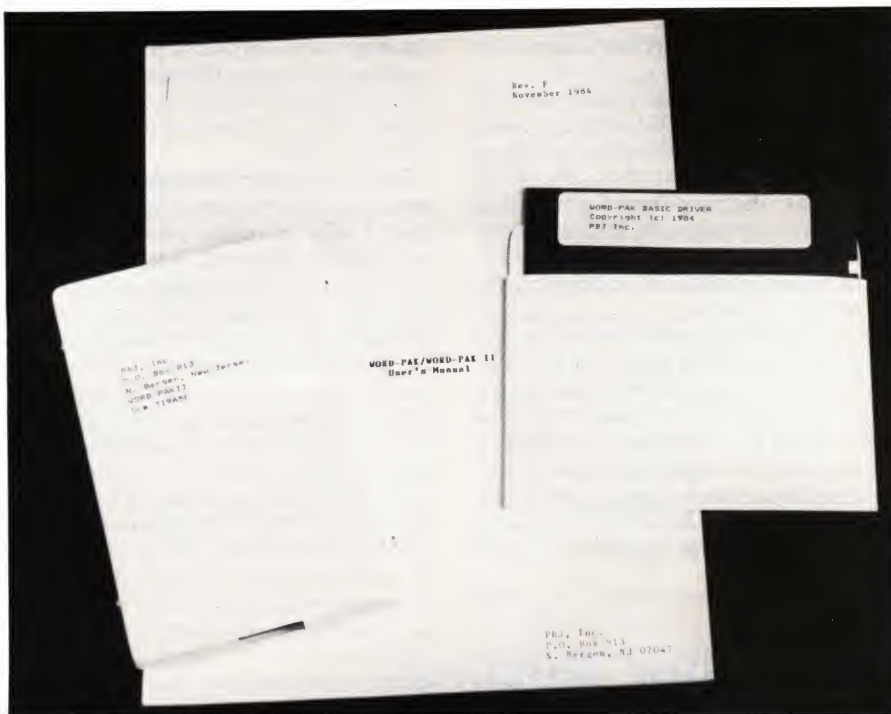
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let you enable or disable a smooth scrolling feature and change the scroll rate. You have to see this to believe it. You can set the scrolling speed to any value from 0 to 255; zero is as fast as the normal screen update on the original Word-Pak, and 255 is so slow that it seems to crawl up the screen. (At 255 it takes five seconds to scroll up one character line, moving one pixel line at a time.) The slow scroll is very handy when, for example, you are examining programs for errors; it makes it much easier to stop a listing precisely where you want it.

Word-Pak II also has a new software-controlled switch that lets you switch between its video output and your computer's video output. To use it, you must modify your Color Computer to generate a monochrome composite video signal.

Word-Pak II contains some minor software revisions on the original Word-Pak software. In some cases, these invisible improvements are very helpful. The left-arrow key autorepeats for character deletion. The clear > key combination initiates automatic insert at the cursor location. The clear right-arrow and clear left-arrow key combinations operate twice as fast for quick deleting and spacing. The clear < key combination deletes char-



Word-Pak II and Documentation from PBJ

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acters under the cursor, pulling those on the left toward the cursor.

Word-Pak II really shines when you use it in conjunction with an OS-9, or Flex operating system. Many programs that use these systems are written for an 80-column by 24-line display. Patching them for the Color Computer's 32-column by 16-line display can be a problem. The upshot is a restriction on the amount of software you can buy for use with these systems.

PBJ sells software on disk that patches several operating systems to work with Word-Pak II. They include patches for Data Comp's Flex, Frank Hogg Labs' Flex, and Radio Shack's OS-9. Each patch sells for \$19.95. If you use one of these systems on your CoCo, you'll find Word-Pak II to be indispensable.

The Flex Word-Pak II software is similar to the Radio Shack Basic version, except you

can use control keys directly from the keyboard to access the 15 control codes. Although it doesn't support on-screen editing, the smooth-scroll feature and the video switch work well.

The OS-9 Word-Pak II software gives you much faster video-screen speed than the original OS-9 Word-Pak software. You can use the RS mode to force Word-Pak II to use the same control codes as the standard OS-9 text display. Characters autorepeat at a rate of 20 times per second after a half-second delay. The Get Status commands give you access to the joystick and its fire button. In addition to the 15 control codes, the OS-9 driver software provides erase-line, delete-line, and insert-line codes.

If you use the Color Computer's standard operating system, you might still find Word-Pak II to be useful. Many machine-language

programs on the market, however, ignore Word-Pak II and use graphics commands to put text on your TV display. Some software has been modified for use with Word-Pak II and is available from PBJ.

If you use your Color Computer for business, especially as a word processor, consider the advantages of Word-Pak II's 80-column by 24-line display carefully. It significantly reduces eyestrain. And it puts a great deal more information on your screen at any one time—where you need it—than the CoCo's standard display. ■

*Word-Pak II is manufactured by PBJ Inc., P.O. Box 813, North Bergen, NJ 07074, 201-330-1898. It requires 16-64K RAM, a multiple ROM-pack interface or Y adapter (\$29.95) for disk operation, and a monochrome monitor. It sells for \$149.95.*

## MusiWriter Musings

by Eric Grammer

	ease of use	documentation	performance	error handling
6				
5				
4				
3				
2				
1				
OVERALL RATING 3.5				
Application Software				

**M**usiWriter is a word processor for music that lets you type music into your CoCo, edit it, and then print out your final version. Instead of using letters, numbers, and punctuation, however, MusiWriter works exclusively with musical symbols.

When you run MusiWriter, it displays a menu of five options. The first is for setting up a new "system" of staves (the five-line bars used in musical notation). This is akin to opening a new file on a regular word processor, except that a MusiWriter file consists of 10 of these systems. MusiWriter systems are probably better thought of as segments or subfiles of a music file. Each system stores up to 10 staves of music, resulting in a maximum of 100 staves per music file.

The second option selects a system that you have already created and stored on disk. The third option edits the current system. In the edit mode, MusiWriter shows you two staves of music: One staff where you do your editing and one for comparison. The fourth option prints the current system, and works only with Radio Shack DMP-110 and DMP-120 printers. The third and fourth options are only visible on the menu when there is a system in memory.

The fifth option is for listing a directory of systems stored on disk. To select a system

already on disk, you must name its file. MusiWriter lists the systems in a file by the numbers 0 to 9; files have word names.

### Beginning a Composition

When you create new music, you must assign a key signature to every staff in the music system you are creating. The first five columns of all staves are unavailable for notes because they're designed to contain these signatures. Pressing the up- and down-arrow keys runs through the list of possible key signatures. You establish a key signature by pressing the enter key. Once you've set it, a key signature remains the same for all the music in your system.

This can be frustrating when you are writing instrumental arrangements. For example, if you arrange a piece of music so that the clarinet line is the first staff, the flute line is the second staff, and the alto saxophone is the third staff, you have to enter the key signatures by hand after you print the music because those instruments usually play in different keys.

Another problem is apparent with key signatures that have several sharps or flats; you might have to leave these out of the signature because they might stick out beyond the five columns allotted to signatures. You'll get the best results when you use C major (which has no sharps or flats) and leave enough room for a signature on each staff.

Once you have chosen a key signature, you select the number of staves you want in the system you're creating. You can choose up to 10 staves. If you enter two or more, the computer prompts you to type a number for the amount of staves you want as accompaniment (0, 2, or 3). If you select 2 or 3, MusiWriter brackets the bottom two or three

staves as in piano music.

Before you begin writing, you must assign a clef to each staff. MusiWriter gives you a choice of treble and bass clefs. This is a shortcoming because it means you cannot enter music for instruments that play in any of the other clefs, such as soprano, tenor, and baritone. It also means that you cannot change clefs in the middle of your music from the edit mode.

### Writing Features

Each MusiWriter staff consists of 60 horizontal positions. The MusiWriter editor uses two blinking lines, each a few pixels across, as cursors that place notes where you want them. One of these lines is called a position cursor. You can use the left- and right-arrow keys to move it horizontally along the staff to the position you want. The other blinking line is called the pitch cursor and is difficult to see. You operate it with the up- and down-arrow keys to select the notes you want. Placing a note requires that you check both cursors to be sure that the note and position along the bar are correct—a tedious process. The pitch cursor wraps vertically around the staff when you reach a note two ledger lines above or below the staff.

Pressing the clear key erases the contents of the position above the cursor. But notes and note combinations do not coincide with position widths. If you make a mistake typing a five-note chord into a position on the fifth note, MusiWriter erases all the notes when you press the clear key. Even single notes are not always contained by a position. The flag on the end of an eighth note might jut out into an adjacent position. To erase the eighth note, you must clear out both positions.

The tutorial that comes with MusiWriter



does a good job of describing how to add or delete notes from the screen. To add a note, you must press a number from 0 to 5 that represents the duration of the note. The 0 stands for double whole note; the 1 stands for whole note; the 2 stands for half note; and the 5 stands for 16th note. You can also enter rests and dots. (Dots increase the duration of a note or rest by half.) Triplets, 32nd, and 64th notes are not possible with MusiWriter, but the program does allow time signatures of 1/1 to 19/8, single and double bar lines, starting and ending repeats, and sharps, flats, and naturals.

When you have pressed a number for the duration of a note, a dot appears on the screen. The difference in the way notes look is largely determined by the number of flags at the end of their stems, except for whole and double-whole notes. After selecting a number for duration, you must press D for downward-pointing stem or U for upward-pointing stem.

MusiWriter does not permit you to enter beams to connect eighth or 16th notes. This is one of the biggest drawbacks of the program. Beam lines connect notes of a duration less than a quarter note and are a standard for all forms of sheet music. If you want to

enter eight eighth notes in a row, the final result with MusiWriter is sloppy and difficult to read.

### Editing

The Color Computer's 32-column display views only about half of MusiWriter staff length at one time. When you want to edit music in the last position, for example, you press the right-arrow key until the position cursor moves you to the end of the staff. The scrolling feature works quickly—one of MusiWriter's advantages. You can also return the cursor all the way to the left of the staff (just after the key signature) by pressing the shift/left-arrow key combination.

MusiWriter inserts when you press the O key. But watch out because doing so pushes notation in the last column out of existence. Pressing the C key deletes a position and adds a blank position at the end of the notation. To stop editing and return to the main menu, you press the Q key. But what do you do if you accidentally ruin a staff of music? If you press Q thinking you can go back to the main menu and select the edit option to start over again, you're in for a big surprise. The Q key not only returns you to the main menu, but it saves the staff you were working

on, mistakes and all, to the disk. The best way to prevent this is to reset the computer and rerun MusiWriter. Doing so has no adverse effect on any music systems you might have on the disk.

### Summary

Despite its professional documentation, well-planned menu system, and easiness to learn, MusiWriter is a disappointment. The 60 positions it allots each staff are barely enough for four measures of music in 4/4 time. I tried typing a 16th note sequence from Beethoven's *Sonata Pathétique* for Piano into MusiWriter, and the best I could manage was 1½ measures to a MusiWriter staff. Moreover, the result was a mess because the disconnected 16th-note flags were difficult to read. I could have done a better job writing the notes by hand. ■

*MusiWriter, v. C1.0D, is manufactured by Tesseract Software Systems, 5350 Montclair Ave., Montreal, Quebec H4V 2L1, Canada. It requires 32K and a disk drive, and sells for \$50 (\$60 in Canada). For optional printing, MusiWriter requires a Radio Shack DMP-110 or DMP-120 printer.*

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# 6809 on Line

by Bobby Ballard

## The Source

It's time for some equal time. I've already discussed the services available on CompuServe in this column. Now it's time to look at The Source and some of its features and services.

The Source, operated by The Reader's Digest Association Inc. in conjunction with Control Data Inc., claims to be the first service of its kind. They call themselves America's Information Utility. Many computer enthusiasts have found a home at The Source.

The services offered are many and varied, from the daily text of *The Washington Post* to the daily schedule of the U.S. House Hearings. They also include SourceMail for electronic mail delivery, job information on The Career Network, Accu-Weather, Associated Press Videotex, United Press International, the Official Airlines Guide, and Capital News Service.

### Prices

At the end of 1984, The Source dropped their initiation fee from \$100 to just \$49.95. This is a little more affordable for CoCo owners. Joining is easy. Call The Source, sign up using a major credit card, and they supply all the information needed to get on line, usually the same day. All billing is through your credit card unless you establish a business account.

A few days after joining, you receive a packet with an assortment of documents and a current copy of *The Source Manual*. This packet includes your service agreement, and it must be signed and returned before your account is finalized.

After you join, connect fees apply based on usage, storage, speed, and time of day. Additional charges are incurred for Source\*Plus, a value-added service providing special information for specific applications.

Connect fees are cheapest in the evening hours using 300 baud. The rate is \$7.75 an hour with daytime rates reaching \$20.75 an hour for 300-baud standard service. Prices are higher outside the contiguous 48 states. There is a \$5 an hour surcharge for 1,200 baud. For The Source\*Plus you pay \$39.75 an hour daytime and \$34.75 an hour evenings. Night rates are in effect for major holidays.

The Source provides storage for personal

records on a monthly per-record charge. Each record measures 2,048 characters and the charges are as follows:

1-10 records	\$.50 a record/month
11-99 records	\$.20 a record/month
100-999 records	\$.15 a record/month
1,000-9,999 records	\$.10 a record/month
10,000-99,999 records	\$.05 a record/month

Unlike CompuServe's current policy, The Source has monthly minimums in place. Each month you are billed for \$9 minimum connect time plus \$1 for your account maintenance and a \$.25 minimum connect fee each time you access The Source.

### Connecting

There are several ways to connect to The Source. The newest way is through SourceNet, but it is not yet generally available. Most of the country connects through one of the packet-switching services such as Telenet, Uninet, or Data-Pac. You may also access The Source through WATS lines. The sign-on procedure for each of these services is provided in your manual and explained when you sign up.

### Getting Around

After signing on, getting around The Source is simple. It's all menu driven, and armed with a few one-keystroke commands you can jump around from database to database. You can enter the following commands at any command prompt:

- P returns you to the previous page.
- M returns you to a main menu for the service you're in.
- Q quits the program you are in and returns you to the command level.
- F# moves you forward a number of pages.
- B# moves you back a number of pages.

Note that the default for the number in the last two commands is one. Entering F or B alone will take you one page in that direction. In addition to these simple commands, The Source offers an advanced technique for command stringing to save time and money.

### Services

The Source provides seven major categories of information and services. Let's take

a quick look at some of these services.

SourceMail leads the features offered under communications. It is electronic mail for members, similar to other electronic mail services. Telecommunicators will find other familiar communication services offered by The Source, including bulletin boards, teleconferencing and chat. You may access E-COM, a bulk-mail service of the U.S. Post Office, and the services of Mailgram also.

The Source is equipped to help travelers by providing The Official Airlines Guide (OAG), Restaurant Guides, Hotel Guides and Travel Services. The Travel Club also makes available world-wide cruise listings, news from travel industry, fare discount information and ticketing services. The OAG is provided by Source\*Plus, which you may access as you need and costs more, as mentioned above.

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To receive more information or to sign up, just contact The Source at 800-734-7500. You may write them at 1616 Anderson Road, McLean, VA 22102.

If you have any questions, comments or suggestions about The Source or any other aspect of CoCo communicating, please write me at the address below. I welcome your thoughts. ■

Address correspondence to Bobby Ballard,  
1207 Eighth Ave. 4R, Brooklyn, NY 11215.

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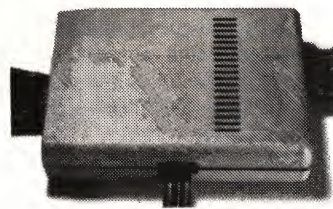
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# CoCo for Hire

by Terry Kepner and Linda Tiernan

## Statistical Data Compilation

If you have a spreadsheet program and a printer, you can make money by using your CoCo to compile and print statistics for customers who have neither the time nor the computer system with which to do the work themselves.

For example, a local hospital conducts an annual survey of the doctors in the area, which asks about their degrees, years as a hospital resident, years in the area, patient load, and so on. The hospital uses these statistics to develop continuing education and other services, and sends them to the American Medical Association for its bank of statistics. But first, someone has to compile all that data and total the figures with the only method they have—the tedious process of counting by hand.

This application is perfect for your CoCo and a spreadsheet. You can organize the questions in columns and the answers in rows. Each questionnaire will fill out one line or row of your spreadsheet. When you have finished entering all questionnaires, you can use the program's sum, average, and count commands to get the totals and percentages your clients require. Then use its formatting abilities to make an attractive presentation of the statistics. If you use this method, your spreadsheet will embody the entire survey; the various numbers, percentages, charts, and graphs it generates are the product and service you provide your customers.

### Finding Customers

You'll find work from small businesses that do annual reports, organizations that must make summary reports to corporations or trustees, (such as libraries, hospitals, foundations, associations, and clubs), people or programs funded by grants, (such as construction projects and visiting-nurse associations), local politicians and government groups, (including town officers, the town clerk, and town committees), students, professors, and others doing bibliographic research, and any group that is conducting a survey.

Don't try companies that are branch offices or affiliates of larger corporations (stock brokers, auto dealerships, and so on). Us-

ally someone at the home office grinds out their statistics.

The best way to start is by sending letters and making phone calls to any groups and organizations that might need your services. Address your inquiries to: "Fiscal Officer." Statistics and money are closely related at most companies and organizations.

If you live near a university, try an advertisement in the student newspaper, and post notes on bulletin boards. Another source is the library—most libraries have reference specialists who might be able to point out clients. Many hospitals and large corporations also have libraries; their librarians might know people involved in statistical research who could use your services.

### The Presentation

Graphics capabilities can make a big difference in how well you sell your statistics-compilation service. A program with an attractive display that prints well is much better than one that makes an ASCII dump. Looks matter.

If you have a printer-plotter and a spreadsheet that will drive it, use them. Pie charts are quite popular. But don't rush out for a plotter or fancy printer unless you begin to get a great deal of business. If customers want fancy graphics, they can always go to any graphics-arts shop to have them custom drawn. You can make overhead-projector transparencies on good photocopiers. Talk to the people at local copy and printing services. They can enlarge or shrink your displays to fit your customers' requirements. This is an inexpensive extra that can go a long way toward making clients happy with your service.

If you have a good graphics-display spreadsheet, but you are without a printer or plotter that can do it justice, consider buying or renting a CRT display camera for photographing your monitor's screen. Kodak and Polaroid manufacture these cameras and produce film for slides and prints. Standard cameras usually can't focus close enough, and the edge distortion they create is very noticeable.

### Prices and Charging

This is a labor-intensive, people-contact

business. If you don't maintain regular contact with your clients, you might not have a clear idea of what they expect from a survey. You could spend many hours poring over reams of data before you even begin designing a spreadsheet, let alone entering the information. But before you begin typing, show your proposed format to your client with examples of data plugged into a mockup. Make sure that you are providing exactly what your customers need.

Your prices should be based on an hourly rate and might range from a minimum of \$5 an hour to \$50 per hour for established professionals. Examine the employment opportunities involving statistics in your area to determine the going rates. Ignore figures on job openings for statisticians, however, because their payscale is higher. Statisticians originate statistics; your service compiles them.

Save sections of layouts that are well received by a customer to use as samples of your work when talking with prospective clients. (Be sure to change the category names and data so that you are showing the format only.) As you build up a portfolio of previous layouts, you'll find that you can use some of them again, providing a savings of time and money that you can pass on to your customers.

### Zoning

Next month we'll conclude our explanation of how to set up and run a statistical data-compilation service, but the rest of the column this month is devoted to a topic of interest to all work-at-home business owners—zoning regulations.

Problems with zoning laws are more likely to affect full-time than part-time businesses. Although not everyone is interested in maintaining a full-time business, part timers should be aware that their businesses could bloom into full-time affairs. Most of the following information applies in some degree to part-time businesses, too.

When you have set a long-term goal and selected a business to match it, you need to consider the mechanics of setting up shop. The first point to tackle is zoning. While you might assume that any home business that doesn't require a storefront is okay, that isn't true. In



most cases, town governments have strict regulations on what is and isn't permitted as a business operation in a residential area. Sometimes business activities that are permitted in a home are not allowed in an apartment. The only way to find out is to ask.

Take, for example, free-lance writing. It seems to be a safe business. After all, no customers come and go from your home (one test on the propriety of conducting a business at home). Nevertheless, many towns consider writing to be a business, and businesses aren't allowed anywhere in a residential area. Why is this law on the books? It is hard to say because it is almost impossible to enforce. The smart thing to do is use common sense in any work-at-home business. Noisy typing or computer printing late at night are bound to anger nearby neighbors. A little consideration for your neighbors can go a long way toward avoiding problems.

A friend with a computer business rented an apartment and explained to the landlords who lived above that computers can create TV and radio interference. She asked them to let her know if they had trouble with their reception. Five months later, without any warning, they asked her to leave because of interference with their TV reception. At her new apartment, she made sure that her

neighbors all had cable television, which resists interference. She operates the printer only during the day, when most people aren't home. She checked with the couple down the hall to make sure the sounds of the printer did not interrupt their baby's nap periods. If you operate a business at home, you'll have to make concessions to accommodate your neighbors.

If your home is more than 100 feet away from those of your neighbors, their TV and radio reception should not be affected by your computer. But sounds carry a long way through open windows on summer evenings. Even if you are sure that your neighbors are not going to complain, it is better to be safe than sorry. Check with your local zoning board before jumping into a home-business project. Your business probably won't be in violation of local zoning laws, but if it is, you can sometimes get an exception or a variance from your town.

The differences between what many towns classify as hobbies (which encompass many part-time businesses and are usually not affected by zoning laws) and full-fledged businesses are not usually beneficial to part-time business owners. Many towns classify a hobby as an activity that produces no profit and has very little regular production. These

same towns probably classify a business as an activity that charges a regular rate for services or products. Your best bet is to learn the law in your area and take steps to accommodate it before you invest in a business that might violate local ordinances.

Please drop me a letter with any comments or questions you have about the businesses we've looked at so far or ones you'd like to see covered in future issues. Or just write and let me know whether or not you've enjoyed CoCo for Hire up until now. I'm also interested in getting the inside story about your home-computer business. How did you start it? What equipment do you use? How have you solved any problems you've encountered? Your tips, ideas, and experiences could be a big help to other readers starting their own businesses. ■

*Address correspondence to Terry Kepner, P.O. Box 481, Peterborough, NH 03458. Terry is a free-lance writer and programmer. He also writes monthly columns for 80 Micro and Portable 100 magazines. He's been writing about computers since 1979. Linda Tierman is a librarian with a master's degree in bio-medical research. She has worked with computers since 1980.*

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# Reader's Forum

## Rubber-Band Lines

The following program demonstrates a positioning feedback technique using rubber-band lines. After running the listing, you select either color set 0 or 1. Color set 1 gives you a good display of the artifacts in PMODE 4.

```
10 PMODE4,1:PCLSL1
20 CLS:INPUT"COLOR SET (0-1)";CO
:IFCO<>0ANDCO<>1THEN20ELSESCREEN
1,CO
30 GOSUB90:PRESET(A,B):FORX=1TO5
0:NEXT
40 IFPEEK(339)<>254THENPSET(A,B,
1):GOTO30
50 D=A:E=B:FORX=1TO250:NEXT
60 GOSUB90:LINE(D,E)-(A,B),PRESE
T:FORX=1TO50:NEXT
70 IFPEEK(339)<>254THENLINE(D,E)
-(A,B),PSET:GOTO60
80 FORX=1TO250:NEXT:GOTO30
90 A=INT(JOYSTK(0)*4.048):B=INT(
JOYSTK(1)*3.032)
100 AS=INKEY$:IFAS="E"THENPCLSL1:
GOTO30ELSEIFAS="C"THEN20ELSEIFAS
="Q"THENEND
110 RETURN
```

Use the right joystick to position the small dot on the first end point on the line and press the fire button for about one-half a second. Now move the joystick. You will see a line being drawn and then erased, producing the rubber-band effect. When the line is in the desired position, press the fire button again and the line will be drawn permanently. Once you get the idea, you can draw various shapes and figures. Press the E key to erase the screen, C to change the color set, and Q to end the program.

Jack Shaffer  
Oakwood, IL

## The Graphicom Foot Switch

Graphicom is a great program with one drawback: You need three hands to operate it. But if you have minimal soldering skills, I have a simple solution for you.

You'll need a subminiature phone jack (make sure it isn't the closed-circuit kind), a Radio Shack foot switch, and a Phillips-head screwdriver. Take the cover off your standard Radio Shack joystick and drill a hole in the side of the front cover to accommodate the jack. Attach two wires (about two inches long) to the jack and solder them in place after stripping the insulation off on both ends of the wire. (See Fig. 1.) Mount the phone jack in the hole and screw on the nut.

Next, solder one wire to the red wire terminal on the joystick button and the other to the green wire terminal on the joystick button. Reassemble the joystick and you are finished. Use the modified joystick in the left joystick port, and then plug in your foot switch to

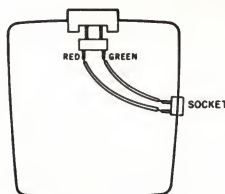


Fig. 1. Mounting the Phone Jack to the Radio Shack Joystick

the joystick. Your joystick works normally with or without the foot switch plugged in.

Dave Foreman  
Winnipeg, Manitoba

## CIRCLE For The CGP-115

The affordable CGP-115 printer lacks a necessary feature for graphics—the CIRCLE command. The following program gives you this feature and can be used alone or inserted in your Basic program as needed.

```
5 PRINT#-2,CHR$(18)
10 CLS:PRINT"RADIUS OF CIRCLE":I
NPUTR
15 PRINT"HORIZONTAL-VERTICAL POS
ITION":INPUTP,Y
20 PRINT#-2,"M"P","Y+R
25 FOR T=Y+R TO Y-R STEP-1
30 U=P+SQR(R*R-(T-Y)*(T-Y))
35 PRINT#-2,"D"U","T
40 NEXT T
45 FOR T=Y-R TO Y+R
50 U=P-SQR(R*R-(T-Y)*(T-Y))
55 PRINT#-2,"D"U","T
60 NEXTT
65 PRINT#-2,"A"
```

K.A. Roller  
Romeo, MI

## EDTASM + Aid

You can list a source file text one screen at a time with EDTASM's P command, but to get the full benefit of it you must keep within 32 characters per line. Though it isn't good practice, you could program without comments. You could also put comments on lines by themselves preceding the code lines as shown below.

```
00100 * comments line 3 in A
00110 Zinit LDA #3
00120 * put in ram
00130 STA $F8
00140 * comments etc.
```

To list your program with control, first enter Pxxx (where xxx is the first line of a program or the line in which you begin the listing). The first 14 lines will be listed on the screen. Repeating P and pressing the enter key will list the next 14 lines, and so on.

If you program with your comments on the same line as the mnemonics, pressing P and enter does the same thing. Since each line takes at least two screen lines, however, you will have only the last seven lines left on the screen. Although I have tested this with only an Assembly-language program, it should work with Basic as well.

### Append or Merge

You can merge or append two Assembly-language programs using the EDTASM +. Suppose you have program A with lines numbered from 100 to 2000, and you want to merge in lines 800 to 1200 of Program B, which contains lines 100 to 3000. The following steps do this merge.

- Using the L command while in Edit, load in Program B.
- With the D command, delete all the lines not needed in it, keeping



only the ones wanted (in our example lines 800 to 1200).

- Renumber the lines left so that they start at a number higher than the highest in first program A, say N2100,10.
- Use the W command to save this to tape. Call it program C.
- Do a delete all by D#.\*
- Load program A.
- Immediately load program C.
- Save the new program or work with it.

Alain Dussault  
Laval, Quebec

## Print Listings in 32-Character Format

Listings printed 32 characters across are easier to proofread, and the program below allows you to print your listings in such a format. Just type in the program, save it, run it, load the program to be LLISTed, and LLIST. The program to be LLISTed loads faster because it doesn't have to be in ASCII format. The program below erases itself to clear memory for the program being loaded and requires 32K RAM.

```
10 FOR X=32710 TO 32765
20 READ A:POKE X,A
30 NEXT X
40 EXEC 32710
50 CLEAR 200,32709
60 POKE 155,33
70 NEW
80 DATA 182,1,103,167,141,0,46
90 DATA 190,1,104,175,141,0,40
100 DATA 134,126,183,1,103,48
110 DATA 141,0,4,191,1,104,57
120 DATA 52,2,150,111,129,254
130 DATA 38,16,150,156,139,1
140 DATA 145,155,37,8,15,156
150 DATA 134,13,173,159,160,2
160 DATA 53,2,18,18,18
```

Nick Volosin  
Visalia, CA

## Using Basic Under EDTASM +

I often leave the EDTASM+ ROM pack plugged in when I use Basic. But on reset the computer defaults to EDTASM+. The Q command returns to Basic, but wipes out the Basic buffer. For a safe return to Basic, enter Z-Bug and type G AOE8. This causes a soft start to Basic. Here's a demonstration:

```
10 PRINT "Welcome to Basic"
20 GOTO 10
EXEC 49152
Z
G AOE8
RUN
```

I use this method to switch from the Z-Bug calculator and back.

Cynthia Allingham  
Claremont, CA

## Logo Printouts, Sans Disk

You don't need a disk drive to print out your child's Logo graphics.

You do need the Multi-Pak Interface and a screen-print utility, though.

Put the Radio Shack Color Logo ROM pack in one slot and leave another slot in Basic. Enter the Logo ROM pack with the appropriate POKE and redraw your child's picture, which should have been saved to cassette as a procedure. When the picture is done, return to Basic by pressing the reset button. The Logo picture is still in memory!

In Basic, enter SCREEN 1,1 and PMODE 4,1 without a PCLS or PCLEAR. The Logo picture will appear, but with a few lines of garbage at the top. Have the child draw inside a narrower than normal border. You can also program some video POKES to remove the garbage. Now just use the screen-print utility to dump the picture to the printer.

H.L. Elman  
Smithtown, NY

## Replacing GOTO

GOTO is probably the most frequently used command in Basic. The format for GOTO insists upon a line number following the GOTO command, and this number must consist of ASCII digits. This number must be a positive integer in a certain range (usually from 0 to around 65000).

Suppose that you would like to follow the GOTO with a variable name or an expression (i.e., GOTO T or GOTO X\*3). This is currently illegal in Basic.

Why would you want this kind of a GOTO? Curiosity would be one good reason. You could implement certain features such as recursion. The following code adds this ability to Basic. I leave it up to you to find various uses for this new GOTO, but I will show how to implement it. The format is:

BRA (expression), where BRA stands for "branch always" and is equivalent to the 6809's BRA command in some ways.

I will not elaborate on what this code does except that it adds the BRA command to Extended Color Basic. Create a CLOADM tape, but before CLOADing type CLEAR 200, &H7EFF to reserve memory.

7F00		0134	00100	ORG	\$7F00
7F00	8E		00110	BRA	LDX
7F03	86	01	00120		LDA
7F05	A7	80	00130		STA
7F07	CC	7F37	00140		LDD
7F0A	A7	80	00150		STA
7F0C	E7	80	00160		STB
7F0E	CC	7F1E	00170		LDD
7F11	A7	80	00180		STA
7F13	E7	84	00190		STB
7F15	7F	013E	00200		CLR
7F18	7F	0143	00210		CLR
7F1B	7E	AC73	00220		JMP
7F1E	81	CF	00230	TOKCHK	CMPL
7F20	25	03	00240		BLO
7F22	7E	B277	00250		JMP
7F25	8E	7F3A	00260	CONT	LDX
7F28	80	CE	00270		SUBA
7F2A	7E	ADD4	00280		JMP
7F2D	9D	A5	00290	BRANCH	JSR
7F2F	BD	B73D	00300		JSR
7F32	9F	2B	00310		STX
7F34	7E	AEA9	00320		JMP
7F37		42	00330	TAB1	FCC
		52			
7F39		C1	00340		FCB
7F3A		7F2D	00350	TAB2	FDB
		7F00	00360		END
00000 TOTAL ERRORS					

Geoff Friesen  
Manitoba, Canada



# The Learning Page

by Nancy Kipperman

## Looking Ahead For the Handicapped

**A** pilot program for handicapped students, using Model 100s and 64K Extended Color Basic and Color Computer 2s, is now underway at the Susan B. Wagner High School in Staten Island, NY.

According to Sheldon Rosenberg, senior assistant for hi-tech programs and data control for the New York City Board of Education, this effort involves students with physical and visual handicaps as well as students with learning disabilities that range from dyslexia to extreme neurological learning difficulties.

Divided into six classes, the students meet daily in a specially equipped classroom and receive instruction in "subject matter, life skills, and basic communications problems" on the Color Computer. Each class of 12 students or less is staffed by a teacher and a paraprofessional, states Rosenberg.

### Homework Computers

TRS-80 Model 100s are issued to the students like textbooks and can be taken home and used to complete assignments. Tandy Corporation has loaned the computers to the school and has also created a word-processing package that is voice-synthesized for blind students. Students who do not have the use of hands or arms use head sticks to manipulate the keyboard.

Realizing that one major problem for students in wheelchairs is comfortable access to a keyboard, Rosenberg and Joseph Salvati of the High School Division, Board of Education, designed a wheelchair lapboard. "This fits over the wheelchair and can be secured in a position so that the student can easily use the computer keyboard," says Rosenberg. "Tandy has produced several prototypes for us free of charge."

Parents and siblings of the students receive free instruction in the use and care of computers from professional educators from Tandy's nearby Radio Shack Computer Center. This instruction includes fundamentals

of computer operation, the care of the computer and its peripheral devices, and the ability to use the owner's manual.

### Affordability Factor

One of the foremost reasons for choosing the Color Computer and the Model 100 for this program was the affordability of the two products. "We are talking of machines that an average family may be able to purchase for a student," comments Rosenberg.

Other characteristics of the Color Computer that influenced its choice were its easy-to-use operating system, ease in attaching the voice synthesizer, the 256-by-192 screen resolution, multicharacter variable names, string arrays of up to 255 characters, full-featured editing, a floating-point nine-digit calculator and trigonometric functions, user-definable keys, and specific error messages. Its easy acceptance of peripherals, including multidisk drives, printer, plotter, and telephone modems were also a factor.

Computer literacy is not the emphasis of this project, however. It is, instead, a way to give these students a state-of-the-art educational tool. Software will enable computer-assisted instruction and will help teachers to meet the requirements of each student's educational plan—that student's unique prescription of goals and needs.

Using computer-assisted instruction and drill also has the benefit of instant and continuous positive feedback and evaluation. Mistakes made by students are detected quickly and concepts reinstructed immediately. One quality a computer possesses is infinite patience with repetition, often necessary for effective education.

In addition to instruction, drill and practice, and problem-solving simulations, students will learn word-processing skills, how to use a filing system, and how to access information data bases such as Grollier's electronic encyclopedia through CompuServe.

This would be exciting for a nonhandi-

capped student, but for the handicapped, this computer education could literally open doors to information that was out of reach before the microcomputer.

### Software Features

In the prospectus for this pilot program, the Board of Education lists some of the desirable software features that address the needs of handicapped populations in schools. For the physically disabled, built-in positive feedback and the ability to add on specialized hardware that can allow a student to communicate are important, as are programs that let a student work independently. Other considerations are programs with realistic vocational application or that can be run by only one movement, such as hand or foot motion.

Other desirable software features include high-resolution graphics and large print and interactive programs that use Braille or a voice synthesizer. Software that incorporates voice and sound and can use headphones and amplification are important.

The absence of time-limit constraints and ample practice for students are necessary. Subject matter might include basic skills in math, reading, spelling, social studies, and general information. Game programs can be used as rewards to be done in leisure time. Finally, programs that encourage problem-solving or include real-life applications, like checkbook accounting, can be useful.

In my book, this pilot program is an excellent example of what can be accomplished with cooperation between public education and private enterprise. Best of all, it is the students who benefit. ■

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*Nancy Kipperman is HOT CoCo's education editor and a high-school English teacher. Write her c/o HOT CoCo, 80 Pine St., Peterborough, NH 03458.*



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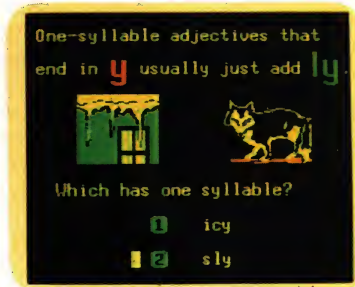
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# Product News

by J. Scot Finnie

## Color Disk Manager, Data Gatherer, Cbreeze, OS-9 Solution, Elite-Calc/3.0, Database Generator, Mail 'n Merge, and Everyone Needs a little TLC

*Information printed in the Product News section is supplied by manufacturers. HOT CoCo has not tested or reviewed the products discussed here and cannot guarantee manufacturers' claims.*

This is a busy month for new utility programs, which might be the most popular kind of software produced for the Color Computer. Utilities make your computer do more, more quickly, and more efficiently. You can even use some utilities to make other utilities. Many Color Computer owners enjoy customizing their programs. With a little ingenuity and the help of the right utility, it's easy to rearrange programs or create new ones to suit your needs.

### Tech Row

Sugar Software has announced two all-purpose utilities that address cassette- and disk-based systems. **Color Tape Manager** merges Basic and machine-language programs, appends machine-language programs to Basic programs, and converts machine-language programs to DATA statements. It requires 32K, Extended Color Basic, comes on cassette or disk, and costs \$24.95. **Color Disk Manager** handles disk-related chores, including selective initializations, verifies, backups, and repairs. It is compatible with 64K and multiple disk

drives. Color Disk Manager requires 32K and is available on disk for \$34.95.

An updated **K-Basic** compiler from Lloyd I/O is now available with some improved and several new functions, including handling of expressions with spaces, automatic data-type conversions, loop structures, a blocked IF...ELSE...ENDIF command, and nest-level indenting. Customers with older K-Basic versions can send in their disks along with \$15 for an upgrade. K-Basic 1.2 requires a disk drive and costs \$199 for either an OS-9 or Flex version.

How about utilities that make OS-9 easy to use? There is very little that sounds easier to use than PBJ's new full-screen editor called **Cbreeze**. According to Al Alberto of PBJ, Cbreeze was modeled after an editor for an IBM mainframe. The utility is designed to make program entry and editing in Radio Shack's OS-9 a breeze. It was written for use with the PBJ's Word-Pak II 80-column package. Contact the company for more information.

Another program that could help with OS-9 difficulties is the **OS-9 Solution** from Spectrum Projects. The utility is designed to make OS-9 easy for anyone to use. It has more than 26 mnemonically-keyed commands and several logical features, such as helps screens and prompts. The OS-9 Solution requires 64K and a disk drive and works with your OS-9 software. It sells for \$39.95 plus \$3 for shipping.

Looking for a low-cost alternative? DSN Computers has a full product line of hardware and software for the Color Computer. Shaun Neal, President of DSN,

mentions the company's **Ram-disk**, **Printer Switch**, and **SPR** spreadsheet (see the product announcement in the January 1985 issue of *HOT CoCo*) from its complement of about 15 products now available or in development. DSN's latest product is **Screen Utility**, which provides a 64-column by 32-row display with mixed text and graphics and a character-font editor while taking up only 1.5K of RAM in addition to the screen memory. The utility requires a minimum of 16K, comes on cassette or disk, and costs \$15.

### Hardware Hangout

Green Mountain Micro is working on a new product called the **Data Gatherer**, a 12-bit, 16-channel data-acquisition system. It has its own operating system, onboard clock, parallel interface, and battery backup. According to Steve Lusk of Green Mountain Micro, the Data Gatherer will be a useful tool for diagnostics, robotics control, data storage, and other functions.

The Electronic Closet is not a mid-1960's rock band—it's a new manufacturer in the Color Computer market. (Compare the name with the term "electronic cottage.") The Electronic Closet makes a small circuit board called the **EC100** that expands the graphic capabilities of the Radio Shack DMP-100 dot-matrix printer. The EC100 creates a new, high-quality, upper- and lowercase character set with true one-line descenders, eliminating the "flying" lowercase characters. The EC100 costs between \$29 and \$39, depending on the model you want. For

more information, contact the company.

### Business Beat

Elite Software's well-respected and full library of software has recently been augmented and refined. The company has released **Elite-Comm**, a smart-terminal program Elite expects to compete with VIP Technologies' VIP Terminal, Eigen Systems' Colorcom/E, and PXE Computing's Autoterm. Elite-Comm, which sells for \$29.95, has a lower price tag than its competition.

Elite Software has also released a new version of Elite-Calc that has several new and interesting features. Elite-Calc was "the first spreadsheet program for the Color Computer with major-league options," according to John Waclo of Elite Software. The new version of the program, **Elite-Calc/3.0**, offers more memory while remaining compatible with worksheets made on the original version.

Elite-Calc/3.0 also has four screen modes, including a high-resolution, 51-column by 24-row format. Other features include window lock, which lets you move columns or rows out of sequence for comparison, and ZAP, a command that allows you to erase all the data from a worksheet while leaving headings, text, and equations intact. The company has a trade-up policy for owners of previous versions of Elite-Calc. Elite-Calc/3.0 sells for \$69.95, plus \$3 for shipping and handling.

Four Star Software, maker of **CoCo Paint** and the innovative **Bugs II** arcade-style game, is



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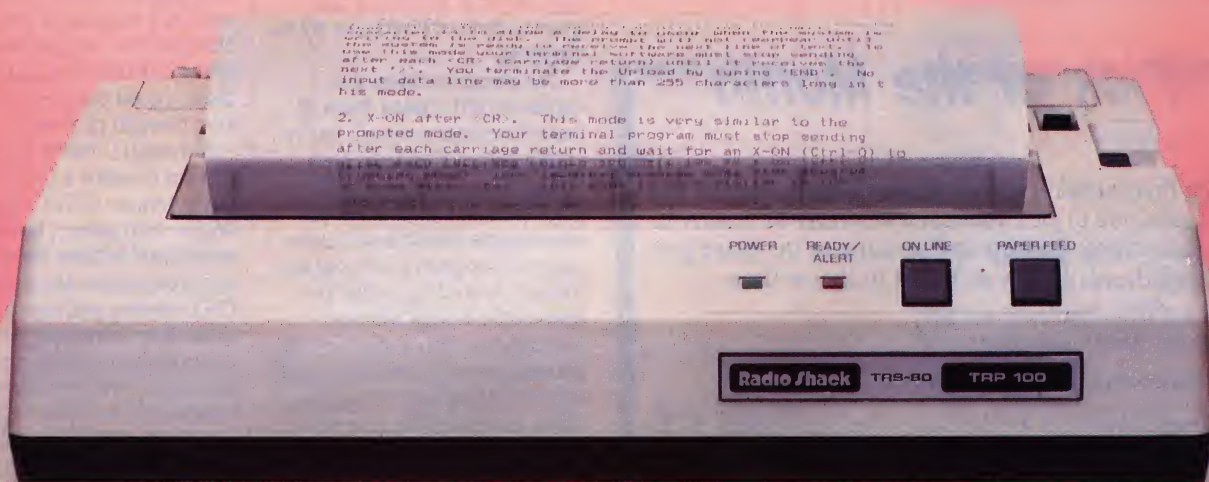
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## Product News

working on a new program that it calls the **Database Creator**. As James Norrie, Vice President of Four Star describes it, Database Creator will interpret your specifications and generate tailor-made database formats. Norrie likens the program to similar applications commonly used on mainframes.

Computerware recently released two disk-based programs, **Mail 'n Merge** and **Personal Finance System**. Mail 'n Merge is a mail-list manager with a mail-merge feature; it can insert customer name and address information into letters you create with your word processor. Personal Finance System manages your monthly budget and lets you compare actual and predicted expenditures. It has a special investment and loan module for calculating the details of complicated financial transactions, such as mortgage payments, principal amounts, amortization tables, and interest rates. Mail 'n Merge requires 64K. The Personal Finance System requires 32K. Each program sells for \$27.95 plus \$2 for shipping.

The documentation that comes with the **Data Pack II** smart-terminal program has recently been added to by Cer-Comp. The separate new 13-page manual explains how to use programmable keys to engage the program's auto-log-on feature. According to Bill Vergona of Cer-Comp, the new manual describes Data Pack II's automation of several accessing chores with step-by-step procedures and examples that you can type into your computer.

**The Instant Yellow Page Service** is offering a novel approach to having you fingers do the walking. You dial this service to retrieve business information from a database of more than 6 million Yellow Page listings. The Instant Yellow Page Service can, for example, provide the names, addresses, and phone numbers of all the computer dealers in Jacksonville, FL. Every business listing is available in many states. And you can access the service 24 hours a day. The company charges \$1 per minute for connect time and 10 cents per printed record. There is also a \$15 per month subscription fee.

## A Novel Approach

The Creative Learning Association has been working quietly on a series of books that form a computer-based curriculum for students of all ages called **Thinking—Learning—Creating: TLC for Growing Minds**. The curriculum is available in versions for several brands of computers. The Creative Learning Association is considering a version for the Color Computer and needs to gauge the response it might get from CoCo owners and educators.

TLC for Growing Minds is intriguing because it teaches Basic programming as a way of providing students an intellectual framework for logical thinking, much as writing has been taught for years. Marilyn Buxton, spokesperson for the company, notes that the curriculum has turned out several fine programmers, but hastens to add that that is merely a byproduct of the TLC curriculum. According to Buxton, the predictable and logical nature of computers and their languages and the fascination that computers hold for many children and adults make them a good conduit for organizing thought processes.

Although Creative Learning has not released a Color Computer version of TLC, the series begins with project books (designed and written for different age groups) that are suitable for CoCo owners and educators because they introduce general Basic programming concepts and exercises. Write and urge the company to work on a new version for the Color Computer.

## Games and Miscellaneous

Real-Time Specialties has come up with an intriguing device called **CoCo Tuner** that allows you to tune your piano with your CoCo. The ROM-pack product works in conjunction with a microphone and emulates strobotuner products that perform the same function. CoCo Tuner sells for \$89.99. For more information, contact the manufacturer.

Computerware, marketers of many intriguing games for the Color Computer, has just re-

## Pick of the Month

The first question on our Reader Service card to the right asks you to pick your favorite article or feature in this issue. Write the appropriate letter in the space provided on the card. Here is the list to choose from:

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- B. Mindbusters, Ramella, p. 20
- C. Smart Terminals for the Disk Drive Set, Parker, p. 30
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## Coming Next Month

Some articles are more popular than others, and one of the most popular that *HOT CoCo* has published was "**64K Modification**" from our July 1983 issue. There have been many changes in the Color Computer since that time, so we asked the authors of that article to bring us up to date on **CoCo memory upgrades** in our June issue. If you're tired of 16K, you won't want to miss next month's *HOT CoCo*.

Speaking of CoCo memory, we'll also give you the scoop on **bank switching**. Bank switching lets you use the "hidden RAM" that all 64K CoCos have, and many popular commercial programs have bank-switching capability built in.

And bank switching is handy for something else: **upgrading your CoCo to 128K**. In June we evaluate two popular 128K memory upgrades from **DSL Computer Products** and **Dynamic Electronics**. Is 128K of memory worthwhile? Decide for yourself next month.

Computers are very good at helping you make better use of your finances. Plan for the future using next month's **Investment Analysis** program by Dev Chakravarty.

Scott Norman returns in June with a new column, **The Computer Room**. There is very little that Scott has not tried with his Color Computer, and his new column will serve as a forum for him to share his experiences and advice with you.

**Assembly 101**, begun in this issue, continues in June with a discussion of the 6809 CPU. This column, by James and Victor Perotti, will guide you through the rigors of learning to program in Assembly language.

June offers more—too much to list here. We hope you don't miss it. ■



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## Product News

leased a new graphic-adventure game called **Dungeon Quest**. The game comes on cassette for \$24.95 and disk for \$27.95, plus

\$2 for shipping. Spectacular Software's **Spaceweb** is a new strategy/arcade game set in the 23rd century that demands fast



Micro Logic's *15 Minute Basic* gives you instant access to Basic commands.

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Sanford's Diskrite markers in silver and gold are safe for all systems.

reflexes and quick thinking. It requires 32K and joysticks, and comes on cassette or disk for \$19.95. **Moses Engineering** has announced a full line of educational, game, and hobby programs for the MC-10 Micro Color Computer. They include math, word, geography, language, and puzzle games. The price is \$7 each for the more than 20 games. Contact the manufacturers of these products for more information.

## Computing Aids

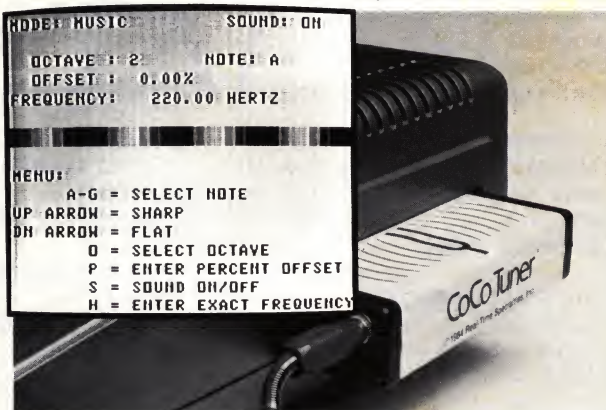
How about a pen that lets you write directly on your disk without using a label? Sanford Corp. has introduced the **Diskrite** computer software markers in gold and silver inks. Diskrite pens let you mark on the sleeves of your disks instead of fussing with sticky labels that fall off (sometimes in your disk drive).

MB International has announced a portable filing folder for your disks. The **Diskaddy** fits easily into your briefcase or handbag and expands to fit up to 22 disks. It sells for \$14.99 at computer retail stores or directly from the company. Do you forget Basic just when you need it most? Micro Logic Corp. makes an 8½- by 11-inch plastic reference card called **15 Minute Basic** with illustrations and easy-to-understand explanations of Basic's constructs. The card sells for \$5.95 plus \$1 for shipping. Is it driving you out of your mind, the sound of your printer, that is? **Quiet Print Inc.** can provide a calming answer. A Quiet Print acoustical cover silences your noisy printer. It sells at \$219 for an Epson FX-80 printer. What would you pay for peace of mind? For more information, contact the company. ■

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Creative Learning Association  
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Charleston, IL 61920  
217-345-1010  
Reader Service ✓ 552

DSN Computers  
37 Stannard Ave.  
Branford, CT 06405  
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Electronic Closet  
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Bainbridge Is., WA 98110  
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Elite Software  
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Instant Yellow Page Service  
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MB International Inc.  
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Moses Engineering  
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The Philip Lesley Co.  
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# Why do more CoCo owners choose 'REAL TALKER'?

*Sure it's priced right, but there's more...*

**Thousands** of 'Real Talker' owners know 'Real Talker' beats ALL other Coco voice synthesizers in ease of use and flexibility. And, NO other Coco talker has a clearer, more intelligible voice. That's quite a lot of advantage when you consider Real Talker's unbeatable price. Yet, Real Talker has some important features that you simply will not find in other Coco talkers:

'Real Talker' is compatible with any 16K, 32K, 64K Extended or non-extended Color Computer. It works with any cassette or disk system and comes complete and ready to talk through your T.V. or monitor speaker. Price includes the 'Real Talker' electronic voice synthesizer in a ROM pack, software on cassette (may be transferred to disk), and user manual.

**'SAY'** command - You'll have your computer talking brilliantly in just minutes thanks to this powerful new command. Type SAY "ANYTHING YOU WANT" and your words are instantly spoken. It's that simple. Think how easy this makes creating speaking Basic programs. Adding speech to your existing programs is a snap too.

**'CONVERT'** - This is a truly powerful command for the basic programmer. CONVERT automatically transforms a machine language dependent speaking program into a stand-alone Basic program. In other words, you can effortlessly write speaking Basic programs that do not require a machine language translator in memory. This is a unique feature of 'Real Talker'. No other voice synthesizer gives you anything even remotely approaching this type of capability - even synthesizers costing considerably more.

Other features include software controlled pitch, unlimited vocabulary text-to-speech, and even a program that will recite any ASCII file (such as from Telewriter-64 & other word processors). You also get Colorware's unique full-screen phoneme editor program that let's you experiment with and modify speech at it's most fundamental level.



*'Real Talker' is a full-featured electronic voice synthesizer unit built into a compact cartridge case. You simply plug it into the side of your computer.*

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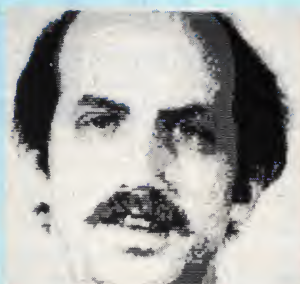
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## TALKHEAD

If you have a 'Real Talker', do not deprive yourself of this absolutely incredible machine-language Talking Head simulation program. While other talking head simulations use a minimal cartoon-like face, TALKHEAD uses high resolution, full-screen, digitized images of an actual person's face to create a life-like animated effect.



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# CoCo Max

*This is one of those rare programs that will captivate everyone in your family.... No one can see CoCo Max and not want to try it!*



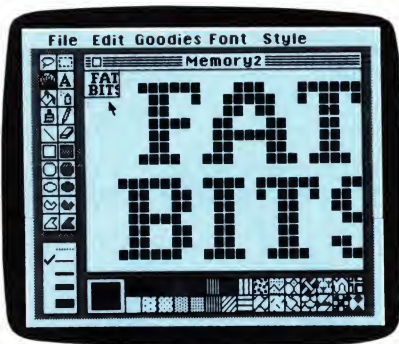
We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.



## UNMATCHED CAPABILITY...

Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. Its unrivaled performance lets you create with more brilliance and more speed than any similar system — much more than you ever imagined possible. And, you can do it in black & white or color.



All the sophisticated power of the bigger systems is there: *Icons*, *Pull-Down Menus*, full *Graphic Editing*, *Font Styles*, and all kinds of handy tools and shortcuts.

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple *Point-and-Click* method to get any of CoCo Max's powerful graphic tools. It has them all:

You can *Brush*, *Spray* or *Fill* with any *Color*, *Shading* or *Pattern*. Use *Rubber Band Lines* and *Shapes* (square, rectangle, circle, ellipse, etc.) to create perfect illustrations with speed and ease. There's a *Pencil*, an *Eraser* and even a selection of *Calligraphy Brushes*. And, as you can see, CoCo Max can do a lot with text. All of the newest special effects are there: *Trace Edges*, *Flip*, *Invert*, *Brush Mirrors*, etc. And all of the very latest super-capabilities like: *Undo*, which automatically reverses your mistakes, and *Fat Bits* which zooms you way in on any part of your subject to allow dot-for-dot precision.



## THE BIG PICTURE

The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and-Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-1/2 times the area of the window itself.

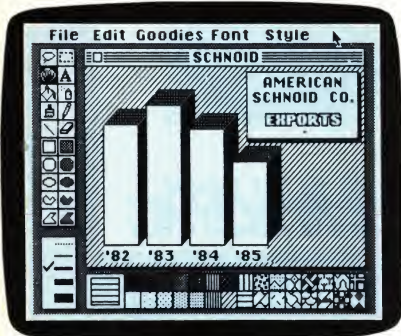
## FLEXIBLE PRINTING...

CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than 1/4 page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to 1/8 page size.



## FREEDOM TO CREATE...

Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,



graphs, and computer art – for serious use or just for creative fun.



tion by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

Plug your same joystick, mouse or touch

You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from \$149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.



## COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-

# THE COCO MAX SYSTEM

## AN ABSOLUTE GUARANTEE

CoCo Max is a hardware software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

## THE HARDWARE...

This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen

pad into this new input and you have a whole new kind of control. The difference is remarkable.

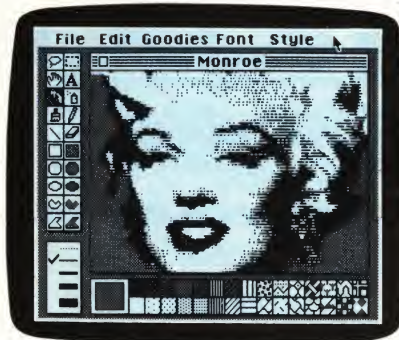


## A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.



has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen. Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limita-



extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y-Branching Cable.

**THE COMPLETE COCO MAX SYSTEM,** with software on **DISK**.....\$69.95

with software on **CASSETTE** (Available Mar '85).....\$69.95

**Y-BRANCHING CABLE**—If you have a disk system but do not have a Multi-Slot Interface, use this economical 40-pin, 1 male, 2 female cable to connect the CoCo Max Hi-Res input unit and your disk controller to your CoCo.....\$27.95



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# The Corner Office

by Jeff DeTray, Publisher

## An Offer You Can't Refuse

Hey! Who's the New Guy?

Good question. You deserve to know a little something about me, especially since I'll be using a page of your magazine for my monthly musings. This month, I'll give you a quick bio, tell you how I came to be publisher of HOT CoCo, then make you a deal, an offer you can't refuse.

For starters, I proudly proclaim myself a hacker. Now wait a minute—I'm not one of those electronic criminals the media are fond of hyping, but a hacker in its original sense. An old style tinkerer. A why-buy-it-if-you-can-build-it experimenter. I built a transistor radio at age 8, an amateur radio transceiver at 16, and a microcomputer (from a kit) at 28. I still have a project or two underway at all times, and I resent the way the noble term "hacker" has been twisted into something bad. Hackers *made* the personal computer industry.

While studying journalism at the University of Illinois, I discovered the joys and frustrations of computer programming. The language was Fortran, and the computer was a room-sized IBM 360/75. We painstakingly keypunched our programs onto cards, submitted our card decks to the computer operator, then returned the next day for the results of the "run." A single typing mistake or syntax error meant a whole day wasted. I loved it anyway.

With an oddball mix of journalism and computer skills, I was ready and waiting when the computer magazines were invented. I joined HOT CoCo's parent company in 1978, shortly after the debut of Tandy's Model I and two years before the Color Computer was born. There were just a handful of computer magazines then, but we did our best to change that, starting (among many others) *80 Micro* and *HOT CoCo*. In the process, I became a confirmed TRS-80 fan and Editorial Director of our magazines. When the Powers That Be asked me to take command of HOT CoCo as its publisher, I took them up on it.

So there you have it: seven years in computer publishing and a lifetime interest in technology. But enough of that. Let's talk about what my being publisher means to you.

### What I'll Do For You

As publisher, my greatest concern is that readers and advertisers alike are well served by their affiliation with HOT CoCo. There is no substitute for quality. I want you to have a magazine full of solid, useful articles—no fluff. I want the programs to be free of bugs. I want the product reviews to say something substantial about the product. A review isn't a review if only the product's good points are mentioned. I want HOT CoCo to provide the best possible environment for advertisers to market their wares. I want you to enjoy the appearance of HOT CoCo, too, so please give me some feedback on the changes we've made starting with this issue.

Now, about that deal. I'm proud of HOT CoCo. But I also know we can be even better. As my half of the deal, I am pledging to make HOT CoCo a better magazine: better articles and columns, improved graphics, better programs, more timely reviews. Whatever it takes, that's what I want to do. But I can't do it alone. You have to help me.

### What You Can Do For Me

There are three specific things you can do that will really make a difference. I am quite serious about all three.

First, communicate with us. Tell us what you'd like to see in HOT CoCo, what you like and dislike about it, what your CoCo club is doing, what you are doing with your Color Computer, and what you'd like to be doing. You're our best source of new ideas.

Write to:     HOT CoCo  
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Second, when you order a product from a HOT CoCo advertiser, tell him you saw his ad in HOT CoCo. You wouldn't believe how important this is. Smart advertisers track results very carefully, and HOT CoCo advertisers want to know that you're seeing their ads. Always remember to say, "I saw it in HOT CoCo."

Finally, renew your subscription early. Don't wait until we've sent you four or five renewal notices. It costs big money to print and mail all those notices, money I could otherwise spend on articles for HOT CoCo. You are going to renew, aren't you?

That's it. Three simple things. Can do? I'm counting on you. See you next month. ■



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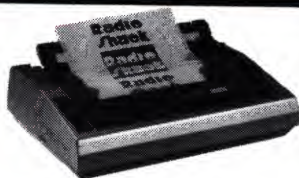
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# The HJL-57 Keyboard

Now available for all models,  
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## Compare it with the rest. Then, buy the best.

If you've been thinking about spending good money on a new keyboard for your Color Computer, why not get a good keyboard for your money?

Designed from scratch, the HJL-57 Professional Keyboard is built to unlock ALL the potential performance of your Color Computer. Now, you can do real word processing and sail through lengthy listings...with maximum speed; minimum errors.

At \$79.95, the HJL-57 is reasonably priced, but you can find other CoCo keyboards for a few dollars less. So, before you buy, we suggest that you compare.

### Compare Design.

The ergonomically-superior HJL-57 has sculptured, low profile keycaps; and the three-color layout is identical to the original CoCo keyboard.

### Compare Construction.

The HJL-57 has a rigidized aluminum baseplate for solid, no-flex mounting. Switch contacts are rated for 100 million cycles minimum, and covered by a spill-proof membrane.

### Compare Performance.

Offering more than full-travel, bounce-proof keyswitches, the HJL-57 has RFI/EMI shielding that eliminates irritating noise on displays; and four user-definable function keys (one latchable), specially-positioned to avoid inadvertent actuation.

### Free Function Key Program

Your HJL-57 kit includes usage instructions and decimal codes produced by the function keys, plus a free sample program that defines the function keys as follows: F1 = Screen dump to printer. F2 = Repeat key (latching). F3 = Lower case upper case flip (if you have lower case capability). F4 = Control key; subtracts 64 from the ASCII value of any key pressed. Runs on disc or tape; extended or standard Basic.

### Compare Installation.

Carefully engineered for easy installation, the HJL-57 requires no soldering, drilling or gluing. Simply plug it in and drop it right on the original CoCo mounting posts. Kit includes a

new bezel for a totally finished conversion.

### Compare Warranties.

The HJL-57 is built so well, it carries a full, one-year warranty. And, it is sold with an exclusive 15-day money-back guarantee.

### Compare Value.

You know that a bargain is a bargain only so long as it lasts. If you shop carefully, we think you will agree...The HJL-57 is the last keyboard your CoCo will ever need. And that's real value.

### Order Today.

Only \$79.95, the HJL-57 is available for immediate shipment for either the original Color Computer (sold prior to October, 1982) or the F-version and TDP-100 (introduced in October, 1982), and the new 64K CoCo. **Now also available for CoCo 2.**

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